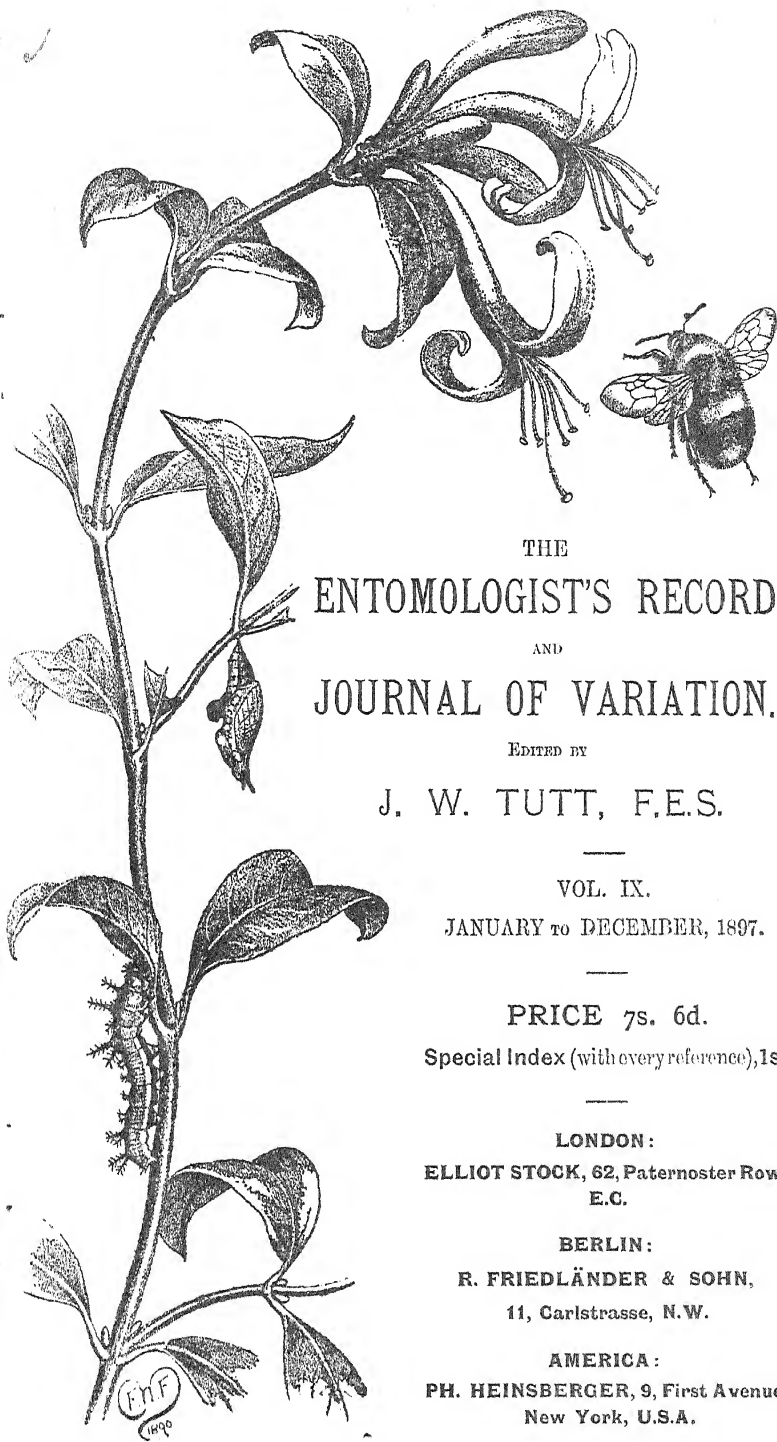




AGRICULTURAL RESEARCH INSTITUTE

PUSA

1658626



THE
ENTOMOLOGIST'S RECORD
AND
JOURNAL OF VARIATION.

EDITED BY
J. W. TUTT, F.E.S.

VOL. IX.
JANUARY to DECEMBER, 1897.

PRICE 7s. 6d.
Special Index (with every reference), 1s.

LONDON:
ELLIOT STOCK, 62, Paternoster Row,
E.C.

BERLIN:
R. FRIEDLÄNDER & SOHN,
11, Carlstrasse, N.W.

AMERICA:
PH. HEINSBERGER, 9, First Avenue,
New York, U.S.A.

PREFACE TO VOL. IX.

ON the completion of another volume we tender our heartiest thanks to our subscribers, contributors, and all those who have been in any way instrumental in increasing our circulation.

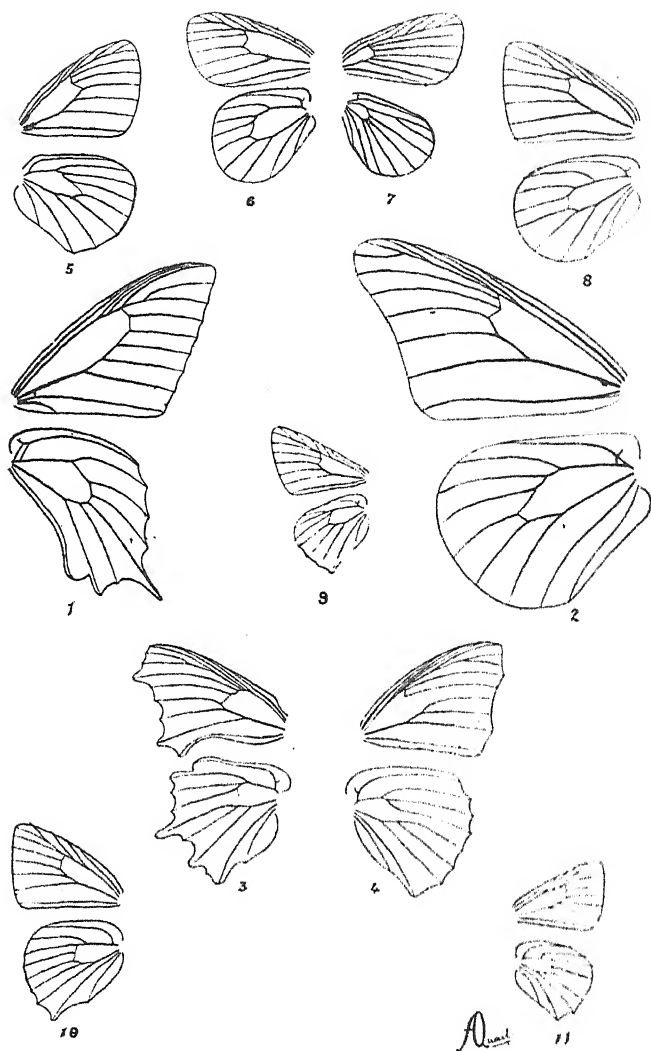
The return to the annual method of publication has resulted in the rejection of a great deal of material for which we could not possibly find room, in spite of the fact that the current volume is one of the largest yet issued.

We have attempted to make a fair selection of the material that has come to hand, and have done our best to cater for the different classes of our readers.

We have one important change to chronicle with regard to the management of the Magazine, *viz.*, that Mr. Horace St. John K. Donisthorpe, F.Z.S., F.E.S., will, in future, be responsible for the editing of all notes on Coleoptera that may appear therein. That we have got such an excellent helper is not only a great source of gratification to us, but must also be so to all our readers who are specially interested in this group of insects.

The large number of "Field Notes" for the different months, already in hand, leads us to state that this feature will be maintained. Already the material in our possession (for some of the months), is much more than we can possibly print.

Again we have to thank Mr. G. B. Routledge, F.E.S., who has, for the fourth time, made himself responsible for the preparation of the *Special Index*.



NEURATION OF THE RHOPALOCERA.

The Entomologist's Record AND

JOURNAL OF VARIATION.

VOL. IX. No. 1.

JANUARY 15TH, 1897.

Retrospect of a Lepidopterist for 1896.

By J. W. TUTT, F.E.S.

We had thought seriously of leaving our annual "retrospect" unwritten this year, but one does not like to drop an old institution which appears to be eminently popular among a large section of our readers. Space, however, forbids us giving more than a very brief summary of the year's work.

The delightful spring and summer—unbroken sunshine and high temperature—after a winter of phenomenal mildness, led to some striking features during the season of 1896. Naturally, these were to a great extent local, and influenced probably by the nature of the soil and the effect of the drought upon it.

Never, perhaps, in the remembrance of many, has there been such a season for the *LYCÆNIDÆ*. Theclids and Lycenids were abundant to a degree rarely witnessed in Britain, whilst the Pierids were, perhaps, equally common. Species, too, were frequently three or four weeks ahead of the normal time. The collector, pure and simple, recognised the latter fact very quickly. The collecting of the larvae of *Thecla pruni* and *T. w-album*, in May, was followed by the capture of many hundreds of their imagoes during the following month. We heard of a collector who killed and set 40 specimens of *T. pruni*, and then owned that not a single specimen was fit for the cabinet. Of *Lycaena arion*, 1,000 to 1,500 specimens are reported as captured, the insects mostly falling to the nets of those who have been in previous years for the same species. Insects like *Leucophasia sinapis*, which produced second broods, did so very early, and the abundance of the dark aberrations of *Limenitis sibylla* in the New Forest was quite phenomenal. A specimen of what was probably *Anosia archippus* (*crippus*) was recorded in June, and another as seen in October, whilst in the autumn several *Euranessa antiopa* were captured, chiefly in Scotland. The most remarkable take, however, was *Aporia crataegi*, near Dover. We have but little doubt that this is a colony, the progeny of ancestors that have been set at liberty and have effected a temporary settlement. The remark that this species is confined in its new haunts "to an area of about a few hundred square yards," is inexplicable, and no one who knows this insect on the Continent can seriously consider this possible.

Among the *SPHINGIDÆ*, the feature of the year has been the abundance of *Acherontia atropos* in the larval state. *Sphinx convoluti*, *C. nerii* and *Psilophila livornica* have also been recorded. Mr. Newnham has

again obtained *Cerura bicuspis*, whilst among the Lasiocamps, Dr. Freer's re-discovery of *Gastropacha ilicifolia* is the most noteworthy capture. The re-introduction of *Calophasia platyptera* to the British list, and the addition of a supposed new species—*Leucania faricolor*, are the most noteworthy facts among the Noctuides. *Xylomyges conspicillaris*, *Leucania albipuncta*, *L. vitellina*, and *Catocala nupta* ab. *caerulescens* have all been recorded, and four *Dasygampa rubiginosa* were taken at Reading, whilst *Caradrina ambigua* has occurred in Devon, as well as in the Isle of Wight, and is undoubtedly a much commoner species on the South Coast than has generally been supposed. *Triphaena subsequa* occurred in its early, as well as later, brood, whilst *Plusia bractea* was bred by Mr. Finlay, and *P. moneta* appears to have become almost common. The breeding of *Pachnobia hyperborea* ab. *alpina* in considerable numbers, is probably also worthy of record.

The micro-lepidopterists have been quite active this year. Mr. Banks is to the fore with *Coleophora glitzella* and *Argyresthia atmurella*. Mr. Durrant has separated the old *Gelechia peliella* into *G. peliella* and *G. suppeliiella*. He also recorded the capture of a large number of *Cedestis gysselinella*, and gave us notes on *Steganoptycha pygmaea*. Lord Walsingham has discarded *Argyresthia illuminatella* as British, and Dr. Chapman has determined the cases of *Solenobia triquetrella*, in Sidebotham's collection, to be identical with those of *S. inconspicua*. Mr. Banks decides that *Nepticula gei* must be called *N. fragariella*. Dr. Sharp comes across *Eriocephala calthella*, and wants to make a Trichopterid of it. The present writer has papers on "*Sciaphila penziana* and *S. colquhouniana*" and *Coccyx cosmophorana*. All micro-collectors are indebted to Mr. Atmore for specimens of *Argyresthia atmurella*.

The destruction of our local insects has loomed large this year. A paper by Mr. Hodge, in our pages, set the ball rolling; a discussion at one of the Ent. Soc. of London's meetings gave it a fresh impetus, and at present it is moving with considerable force. In our opinion (and it seems to be a very general one), action has not been taken before it is needed. We are, we believe, good field naturalists; we think little of the purely closet naturalist; yet there can be no doubt that collecting is very much overdone in Britain, and, without hindering *bona fide* collecting, one does want to find a means of stopping those men who, posing as amateurs, go year after year to the same localities, obtain the same species of insects for exchange, and never make a single scientific observation about the insects they do their best to exterminate. We wish the committees, now considering the best means of dealing with the subject, all success.

The periodical excitement about *Tephrosia histortata* (*crepuscularia*) and *T. crepuscularia* (*biundularia*) is almost inexplicable. So is that about *Bombyx quercus* and *B. callunae*. Probably it is because these two pairs of insects form the best illustrations, in our fauna, of "species" in the process of formation. Too much of a good thing, however, becomes somewhat tedious, and we doubt whether many British lepidopterists have not had quite enough of these.

We cannot report very satisfactory progress in the number of Fellows our annual appeal obtained for the Entom. Soc. of London during the past year. The large average of the two previous years has not been maintained, and there must yet be a very large number of ento-

mologists who do not see the *Transactions* of the Society. The City of London Entomological Society deservedly holds a high place, thanks to Messrs. Prout, Bacot, and others, whose scientific papers are of the highest value. Their excellent meeting-place at the London Institution should attract all London entomologists. The South London Entomological Society—thanks to its excellent secretaries—has provided a good list of papers to be read, and issued their *Proceedings* fairly early in the year. The North London Entomological Society maintains its active course, whilst of our provincial societies, that at Leicester has taken quite a lead in the question of the “destruction of our local insects.” Their *Proceedings*, too, contain some excellent papers. The Lancashire and Cheshire Society held an exhibition while the British Association meetings were going on in Liverpool. Of the Birmingham and York Societies we hear next to nothing. It is a pity some scientific work is not regularly turned out from these centres. The Cambridge Society, under the guidance of Dr. Sharp, maintains its position, whilst the Nonpareil Society appears to gratify the gregarious want of the workers of East London.

Of papers that have been read this year, few can be classed in the first rank. “On the relation of the mimetic patterns to the original” (Dixey, *Trans. Ent. Soc. Lond.*); “Notes on Pupæ—*Orneodes*, *Epermenia*, *Chrysocorys* and *Pterophorus*” (Chapman, *Ibid.*), and “On the Phylogeny and Evolution of the Lepidoptera from a pupal and oval standpoint” (Chapman, *Ibid.*), are the best. A brief summary of the latter is published, *Ent. Rec.*, viii., pp. 287–289. Many useful papers, however, may have attention called to them:—“Some aspects of hibernation” (Dixey, *Ent. Rec.*); “On *Alucita* (*Orneodes*) *hexadactyla*, chiefly in relation to the structure of the pupa” (Chapman, *Ent. Rec.*); “Antennæ of Lepidoptera” (Bodine: *resumé* in *Ent. Rec.*); “Relationship of *Endromis* to the Sphingides” (Bacot, *Ent. Rec.*); “Relationship of the lower Lepidoptera with Trichoptera” (Tutt, *Ent. Rec.*); “On the structure and development of the lepidopterous wing” (Sharp, *E.M.M.*); “Experiment bearing on the number of larval instars and the distinctness of larval and pupal instars in Lepidoptera” (Chapman, *E.M.M.*). Classification has given us, besides Dr. Chapman’s papers,—“The modern principles on which classification is based” (Tutt, *Trans. City Lond. Ent. Soc.*); “Neuration in the Lepidoptera, etc.” (Quail, *Ent. Rec.*). The discussion on “hybernation” has produced:—“The resting habits of insects” (Riding, Kane, *Ent. Rec.*); “How *Colias edusa* winters,” “The hibernating stages of British butterflies,” “Hybernation of certain butterflies in the imago state” (Tutt, *Ent. Rec.*). “*Melanippe fluctuata* and its varieties,” and “The *Tephrosia* tangle” (*Ent. Rec.*) remind us that Mr. Prout loves to unravel synonymy; whilst the papers on “Mimicry” (*Ent. Rec.*) state critically Prof. Weismann’s latest pronouncement on this subject. “The aberrations of secondary sexual characters in Papilionidae” (Watson, *Entom.*) should also be read.

On the other side of the picture we have “Fungi parasitic on butterflies” (Rickard, *Entom.*), in which the author described the well-known *androconia* as fungi, and stated that he was cultivating spores from them on glass. “The senses of insects” (Arkle, *Entom.*), from which we learn only one fact, *viz.*, that the author’s “faith lies in the story of the creation.” Then there are sundry wordy articles

"On the vertical distribution and derivation of the *Rhopalocera* in the Pyrenees," etc., etc. (Bath, *Entom.*). We can only say of these that we envy the author's flow of mystifying verbiage, but when this has been separated from the remainder (and there appears very little left), one is inclined to wonder whether the notions of the Alps, based on the witness of one's senses, must undergo reconstruction. We have got beyond those early days when we thought that everything that puzzled us must of necessity represent a vast depth of wisdom.

Of separate works there are some exceedingly good ones, the best—"Über die palpen der *Rhopaloceren*" (Reuter) and "*Bombycine Moths of America*" (Packard). Of purely British works the writer's "*British Moths*" (Routledge and Son) has been published to take the place of Wood's "*Common British Moths*," which was so woefully out of date, whilst "*British Butterflies*" (Gill and Son) is simply a cheap Newman up to date, the life-history, synonymy, distribution, etc., of every British species being fully written up, and figures of every species given. "*New experiments on the seasonal dimorphism of Lepidoptera*" (Weismann) has been translated in an excellent manner by Mr. W. E. Nicholson. "*Butterflies*" (Kirby), although presenting no attractions to the purely British collector, is of the greatest use to entomologists interested in geographical distribution. "*British Sphingidæ*" (Lucas) is a very useful little brochure, whilst a still smaller volume is "*Insects and Spiders*," which deals with the physiology and anatomy of insects in a concise manner. The expensive work, "*The Lepidoptera of the British Islands*" (Barrott), is, after five years, quite in its infancy, only a part of the old Macro-Lepidoptera as yet having been dealt with. We have just received from Mr. N. M. Richardson a pamphlet entitled "*Tinea vinculella*," a species of Lepidoptera new to the British fauna, and illustrated in her usual careful, artistic and correct manner, by Mrs. Richardson.

We have only touched on a few of the points that naturally occur to us, when mentally reviewing 1896 from an entomological standpoint. To-morrow is New Year's Day. Our fervent hope is that 1897 may prove a successful season alike to the collector, to the observer, and to the student. May our societies prosper, and may the entomological literature of the forthcoming year exceed in scientific value that of the past.

Neuration of the *Rhopalocera** (Illustrated by Plate).

By AMBROSE QUAIL.

On the argument that "modification tends to reduce the number of nervules" (*ante*, vol. viii., p. 153), it seems logical to consider that, of any superfamily, the genus or family which has the greatest number of nervules, is the lowest.

In the *Rhopalocera*, PAPILIONIDÆ has the greatest (total) number of fore-wing nervules (Plate I., fig. 1), but one less hind-wing (anal) nervule, than the Pierids and Nymphalids. Certain characters, *viz.*, the fore-wing cubitus-anal connection, one of the anal nervules, and hind-wing subcostal radius connection in the PAPILIONIDÆ, are modi-

* Extract from paper read before the North London Nat. Hist. Society, Aug., 1896.

fied in the lower NYMPHALIDÆ, in which the cubitus-anal connection becomes a cubitus blotch, the anal nervule becomes abortive, and the sub-costal radius connection (area) is much reduced (Plate I., fig. 2); they are totally lost in the higher Pierids and Nymphalids. In general form of neuration, however, the Fam. PAPILIONIDÆ differs largely from all other families of the Rhopalocera, in having a fore-cubitus nervure with four nervules. It possesses only one media nervule (fore) as such, *i.e.*, attached directly to the transverse nervure which forms the discoidal cell. In the general form of neuration, Nymphalids, Pierids and Lycænids agree in having the fore-cubitus nervure with three nervules. The Nymphalids have two fore-media nervules, as such, and throughout the family these are retained. DANAIID (fig. 2) is one of the lower Nymphalid tribes; it has the cubitus blotch, an abortive anal nervule, and a modified sub-costal radius connection. Extremes of modification in this family seem to be the total loss of the transverse nervure which forms the discoidal cell as in *Junonia* (fig. 4) and *Apatura*; our indigenous *Vanessidi* (fig. 3), and *Argynnidi* seem intermediate, as they retain the cell-vein of the fore- and hind-wings (except *Pyrameis cardui*, which has partially lost the hind cell-vein), but have lost the modified Papilionid characters found in *Danaidi*. The Fam. SATYRIDÆ (fig. 5), seems to have evolved close to *Danaidi*. Its species have a very Nymphalid neuration, and the bases of the fore-cubitus and anal nervules are much thickened. This seems to be a modification of the cubitus blotch and abortive anal nervule. *Leucophasia* (Plate I., fig. 7) retains two fore-media nervules as such. *Euchloë* (fig. 6) has the same total number of nervules as the Nymphalids—but not the abortive Papilionid characters. *Euchloë*, however, has only one fore-media nervule as such, and if “alteration of position often causes one nervule to fork on to another, especially at the angles of the cell,” it is evident that this has happened with *Euchloë*, and all of the *Pieridi* and *Rhodoceridi*, *e.g.*, one of the media, by attachment to the radius nervure has caused the other radius nervules—which were already forked on to each other—to fork on to it. The *Pieridi* and *Rhodoceridi* have one less radius nervule than *Euchloë*, and *Pieris daptidice* (fig. 8) has one less radius nervule than typical *Pieridi*. *Nemeobiidi* (fig. 9) has a modification of the radius (hind) nervules, and a similar general form of neuration, to *Leucophasia*, though the Fam. LEMONIDÆ shows the same forking of fore-radius nervules as the Pierids and Rhodocerids. *Theclidi* (fig. 10), *Chrysophanidi* (fig. 11) and *Lycæanidi* have a higher neuration than *Nemeobiidi*. Inasmuch as the Pierids and Nymphalids, etc., have one hind anal nervule more than have the Papilionids—it seems safe to assume that the latter have lost one—and, as the former have modified Papilionid characters, it seems that they must have evolved from a common ancestor, rather than that the Pierids, Nymphalids, etc., have arisen more directly from the PAPILIONIDÆ.

EXPLANATION OF PLATE I.—(1) *Papiliomachaon*. (2) *Anosia archippus*. (3) *Polygonia c-album*. (4) *Junonia orithya*. (5) *Enodia hyperanthus*. (6) *Euchloë cardamines*. (7) *Leucophasia sinapis*. (8) *Pieris daptidice*. (9) *Nemeobius lucina*. (10) *Zephyrus betulae*. (11) *Chrysophanus phlaeas*.

A critical resumé of the arguments for and against *Tephrosia bistortata* (*crepuscularia*) and *Tephrosia crepuscularia* (*biundularia*) being considered distinct species.*

By J. W. TUTT, F.E.S.

(Continued from vol. viii., p. 287).

The third and most strenuous upholder of the one species idea is Mr. C. G. Barrett. His utterances on the matter have been frequent, and his opinion appears to have been based on the following considerations:—(1). Mr. Barrett received, in 1886, from Derbyshire, "specimens of the dark grey variety of what" he "should have called *biundularia*, but they were taken on April 12th and 24th respectively," *ergo*, they "appear at the time for *crepuscularia*." They are "of a dark grey colour, and bear no more resemblance to one form (normal *crepuscularia*) than to the other (normal *biundularia*)," *ergo*, "if we still continue to look upon *crepuscularia* and *biundularia* as distinct species, we shall, for the sake of consistency, be compelled to make one or two more species to admit these grey and blackish forms" (*E.M.M.*, xxiii., pp. 41–42). One suggestion at once occurs: If the two specimens did not more closely resemble *biundularia* than *crepuscularia*, why would Mr. Barrett have called them "*biundularia* certainly," had they not been "taken on April 12th and 24th?" Records of *T. biundularia* in April have been frequent of late years in the *Entom. Record*. (2). Professor Zeller, in 1878, wrote to Mr. C. G. Barrett:—"I wonder why Staudinger separates these; I deny their specific right not allowing the time of appearance to prove it. With us both are together, and, moreover, a dark variety." At the same time he sent Mr. Barrett some "dark grey specimens," with "a challenge to pronounce as to which they belonged." The "dark grey specimens" suggest the ordinary German type, the true *bistortata* of Goetze (*vide*, Prout, *Ent. Rec.*, vol. viii., p. 78), quite different from the two seasonal forms of *crepuscularia*, and from *biundularia*. Mr. Barrett failed to do so, and "the examination was deferred." I am under the impression that Mr. Barrett has since told me that he then had no Scotch specimens of *crepuscularia* at the time (although Doubleday knew the Scotch form well). The Scotch form is very near the German (with a sprinkling of individuals leaning to the southern spring form (var. *abietaria*, Haw.), and had Mr. Barrett had a glance at any of these he would have recognised the German form at once.* (3). Mr. Barrett writes (*E.M.M.*, xxiii., p. 87):—"The supposition that *crepuscularia*," as distinguished from *biundularia*, "is double-brooded is a mistake. I have taken second-brood specimens of both forms in July or August, in the south of Surrey, and have them now before me." As the insects were captured wild, this is, of course, a pure assumption. We may fairly ask Mr. Barrett to tell us how he separated and distinguished the second-brood specimens of what he considered these two species. (4). On June 11th, 1886, Mr. Barrett took an odd specimen of *biundularia* in Staffordshire, "which actually agreed far better with *crepuscularia*, only differing in the

* The Continental specimens exhibited by Mr. Barrett at the meeting at which this paper was read were a mixture of the two species, some of which were typical *T. bistortata*, and others were dark aberrations of *T. crepuscularia* (*biundularia*).

umbrinous instead of fulvous character of the brown markings. On June 19th, the Rev. C. Thornewill, of Burton, also took a brown-lined specimen, very similar, and these two are the nearest to the southern *crepuscularia* that I have seen." This is the sum total of the evidence offered by Mr. Barrett, and the opinion based on this evidence reads as follows:—"It seems to me unreasonable to attempt to keep up the purely artificial distinction between these two forms. They should surely be united." However, like Mr. Smallwood, Mr. Barrett was not comfortable, so he goes on:—"If we admit that these forms constitute but one species, we are still confronted by the remarkable phenomenon, for which no reasonable explanation seems to present itself, that two races exist in the same localities, emerging at different periods, and presenting a constant difference in the shade of colour.* We know that the *biundularia* which emerge in May, are not the offspring of the April *crepuscularia*,† and, as far as investigation has gone, we find that the offspring of each form emerges at the same time as its parents, and presents the same characteristics—setting aside the few which feed up quickly and emerge the same season, and exhibit similar characters in a modified form. We have, in fact, a curious instance of dimorphism in both sexes"‡ (*Ibid.*, p. 87). Now, if this remarkable paragraph means anything, it appears to me to mean this—I see there are two very distinct species of moths which I can readily differentiate, but as I am puzzled where to put a few German specimens, and a couple of Midland ones, it will save a lot of trouble to call them one species.

Mr. Robson very fairly criticised (*E.M.M.*, xxiii., pp. 111–112) this paper. He adds no new fact, however, to the discussion, and we demur strongly against his acceptance of the statement, that "the offspring of both insects in favourable seasons or localities feed up and emerge the same year, or part of the brood does." We doubt whether more than a very occasional specimen of *biundularia* does this. It has certainly never been shown, except in two solitary instances, that it does so. His conclusion that "it seems much more unreasonable to ignore the truly natural distinction between them, merely because, in odd specimens, we are unable to find an artificial—perhaps I had better say superficial—distinction," will surely commend itself to all lepidopterists.

The next occasion on which Mr. Barrett refers to this subject in the magazines is in 1895, when he describes (*E.M.M.*, xxxi., p. 199) some observations made by Sir John T. D. Llewelyn on the increase of melanism which was observed in "*Tephrosia crepuscularia*, and its form, *biundularia*." It would appear that, in 1866, Sir J. T. D. Llewelyn first observed the dark aberrations of *T. crepuscularia*. He reared the same form from eggs laid by dark females in 1868 and 1872, and it was not until "ten years later that the same careful observer found that this form of variation had extended to the parallel, later-emerging, whitish form of the species (by some held to be distinct) *biundularia*; but he noticed that in this the variety was 'black, but with the sub-terminal line conspicuously pencilled out in

* This is remarkable, in face of the importance attached to the colour of the Staffordshire specimens in the paragraph numbered 4 (*ante*, p. 6).

† Compare this with the remarks quoted from the *E. M. M.*, vol. xxxii., p. 229, further on in this paper (*vide*, p. 8).

‡ ? "species," not "sexes."

white.''' It does not seem to Mr. Barrett to have been illogical to describe *biundularia* as a whitish form of *crepuscularia*, when Sir J. T. D. Llewelyn had actually separated the species for ten years, showed that the melanic tendency to variation had developed independently in the two species, even in the same locality, and that, when, at last, *biundularia* did develop a tendency to melanism, its melanic form was characteristically distinct from that of the earlier species.

In October of this year (1896), Mr. Barrett made a more startling addition to his views, in which he recanted his former opinion, when he wrote:—"We know that the *biundularia* which appear in May are not the offspring of the April *crepuscularia*," for he now says (*P.M.M.*, xxxii., p. 229):—"I want emphatically to draw attention to these details—the second brood of the brown *crepuscularia* is obviously *biundularia*; and, moreover, the evidence produced shows clearly that the frequent assertion of absolute single-broodedness in the white *biundularia* form is erroneous." The first assumption is astounding. The second is based on the fact that Mrs. Bazett was given specimens of a *Tephrosia*, taken by a keeper in July last, at light, in a wood in which Mrs. Bazett had never seen *crepuscularia*, but in which *biundularia* occurs abundantly. To come to the conclusion that these must, therefore, be the second brood of *biundularia*, is surely playing 'ducks and drakes with scientific enquiry.

Moreover, we are constrained to get one more explanation from Mr. Barrett. Why should the sight of these "very pretty, neat, white creatures, not more than one-half the size of the parents,"* lead Mr. Barrett to conclude that they are, "in markings and colour, typical southern *biundularia*"? Are we to take it that he had never seen similar specimens before? But this can hardly be, for ten years before Mr. Barrett had written (*P.M.M.*, xxiii., p. 86):—"Another point has been put forward, the double-broodedness of *crepuscularia* as distinguished from the other, which is single-brooded; but this is a mistake. I have taken second-brood specimens of both forms in July and August, in the south of Surrey, and have them now before me." What Mr. Barrett had before him, as the second brood of these species in 1886, it is difficult to say. One thing is moderately certain; they could scarcely have been the second brood of *crepuscularia*, or he could have hardly expressed his surprise in such measured terms in 1896. Mr. Barrett treats Mrs. Bazett's discovery, that the second brood of *T. crepuscularia* consists of small, white specimens, as a new discovery, when, as a matter of fact, the knowledge goes back to Stephens and Wood, who both described two forms of this second brood as *consonaria* and *striptularia*. Yet this explanation is practically denied us, for there is another remark made by Mr. Barrett as to his knowledge of the second broods of both species. We read, *Proc. Sth. Lond. Ent. Soc.*, 1890, p. 25) that Mr. Barrett said that in his experience he "had found the form *biundularia* to produce a second brood as frequently as the other." As to a second brood of *biundularia*, in nature, it is practically unknown, and hence, if Mr. Barrett really has specimens of the second brood of this species, we shall see them, I trust, to-night.† Still my own series shows much variation in the

* By-the-bye, what is known of the parents of these individuals which were captured wild, at light?

† The specimens, we are sorry to say, were not exhibited.

specimens of the second brood of *T. crepuscularia*, and if Mr. Barrett had but scanty material, he might easily have made a mistake.

If my remarks should appear in any measure to step outside the bounds of fair criticism, I apologise most humbly. No one knows better how much store I set on Mr. Barrett's critical ability than he does himself, for he has helped me immensely. I know he will acquit me of truculence and be the first to acknowledge that a brutally logical argument is the only way to clear up the illogical position that entomologists are at present in with regard to *Tephrosia crepuscularia* and *T. biundularia*.

(To be continued).

Habits of the larva of *Apamea ophiogramma*, with some notes on breeding the insect.

By W. B. THORNHILL.

Having for several seasons caught stray specimens of *Apamea ophiogramma* flying and at sugar, in this locality (Castle Bellingham, Ireland), and having a ditch with plenty of *Arundo phragmites* growing in it close by, I made a close search for larvæ in the reeds last spring (thanks to hints from my friend Mr. Kane). I began my search early in April, but found no larvæ until May 1st. These were identified for me as those of *Apamea ophiogramma*. From that date, up to May 25th, I continued to find larvæ, though much more sparingly towards the latter date. Those that I found on May 1st pupated in about ten days, thus being nearly full-fed when found. Curiously, practically all I found were about the same size, and all seemed to pupate in about the same time. This fact leads me to suppose that the younger larvæ live in the roots, or some not very vital part of the plant, for I found none of my larvæ in stems that were not withered in the topmost shoot, with frass coming from one or more holes in the stem lower down, and none that I found were young larvæ, although I searched particularly for such, as the uniform size appeared difficult to account for. The larger proportion of the larvæ I found had not eaten their way up the inside of the stem from the root, but had evidently crawled up the outside of the stem, and then, when some six to eight inches above the ground, eaten their way in, fed on until they had disposed of all the edible part of the shoot above them, and then bored their way out again and entered another stem, and so on. I shall be glad to learn if others have found the larvæ in a young state, and on, or in, what part of the plant. I may add that, although I have plenty of the striped ribbon grass in my garden, about 50 yards from the ditch in question, I could not find a single larva feeding there, apparently pointing to this food-plant as an artificial one. The larvæ found, fed up equally well on growing plants, or cut stems placed in water. For the most part they pupated in the earth, although some made use of any loose friable matter they could find, and a considerable number of those fed on the growing plants, pupated in the dead stems of last year's grass, from two to three inches above the ground. All those fed on the cut stems left them, and pupated in the dry earth of a breeding cage. The first emergence took place on June 26th; thus (allowing ten days from the

date of finding until pupation) forty-seven days appear to be about the length of the pupal state. The last emergence was on July 18th, and none are lying over. The greatest number emerged on July 7th. There seems to be no particular time in the day for emergence, though, perhaps, the majority appeared about mid-day, and none emerged after 4 p.m. I bred a considerable number, and was surprised to find under three per cent. cripples. The proportion of males to females was 1 to 2, as near as may be; some $7\frac{1}{2}$ per cent. were ichneumonised by *Phygadeuon abdominalis*, as I understand from Mr. Billups' note in the *Ent. Rec.*, vol. viii., p. 207. I found no noticeable variation in the imagines, even in a considerable number.

The cocoon made by the larva is very slight, oval, and formed of fine white silken threads and loose earth, when subterranean. If formed in a reed stem, it spins only a very slight white silken cocoon, just attached to the stem.

Notes on Coleoptera.

“MUD-LARKING.”—THE BEETLES OF A MUD-FLAT.

By CLAUDE MORLEY, F.E.S.

Most of us probably have a more or less dim recollection of the happy days of our childhood, when “mud-larking” on the sands formed one of the principal of enjoyments. Many of us still do our share of scientific “mud-larking,” and, in fact, we could not obtain certain species of Coleoptera and Hemiptera by any other means. Of the former the species most often found belong to the two great sections, GEODEPHAGA and BRACHELYTRA, though most of the others are represented. The time of year at which the greatest number of these beetles may be found is probably the end of May and June, and the mere fact of the sun shining will quite double the number of insects to be seen. That is to say, if you know *how* to see them, for a fisherman, or a poet, might sit on a bank and gaze for hours at a mud-flat a foot or two below him, and see simply nothing, where a coleopterist, seated on the same bank, would, as soon as his eyes became familiarised with the angle of light, see tiny beetles of all shapes, sizes and colours, rushing about in all directions, and, for the most part, for things so small, with incredible alacrity. So fast, in fact, do they go, and so easily and unerringly do they steer their way, that one falls to wondering how they do it, but to find out there and then is simply impossible; since the pace at which they dart about renders the following of the insects themselves a matter of difficulty, and of their legs, of impossibility; so we must turn to the cut-and-dried laws of “Insect Propulsion.” There we find that each of the six legs is composed of a number of hollow tubes, within which are placed tiny muscles; these muscles, by their expansion and contraction, like our own, are capable, so wonderfully elastic are they, of all the lightning-flashes an insect will perform across a piece of damp mud. We are not in the least surprised to find these legs move in the most logically advantageous manner, for Nature makes nothing but in a way that is best adapted to its environment. Thus we find two legs on one side lifted simultaneously with one on the other—the front and back legs on one side with the middle one on the other—make the first half step,

and the remaining three legs complete it. This rule, of course, excludes the water insects, which would simply gyrate from side to side if they attempted to follow it, and consequently they possess a large pair of hind legs, usually furnished with long swimming hairs, which they use and "feather," exactly as one does the oars of a boat.

Sitting upon the gently-shelving margin of a stream or pond, with muddy stones, slightly embedded in the ooze, and patches of rejectamenta—dead leaves, faggots, and such rubbish as generally finds its way into water, strewn about upon the mud, we shall see by close observation that that just beneath us, from which the water has receded through evaporation caused by the hot sun, which is still shining brightly, is simply alive with riparian insects. Of these *Anchomenus marginatus* will be about the largest, and a handsome fellow he is, too: metallic green, with the distinguishing white marginal streak at the sides of the elytra, and many others of the genus will be there; *A. viduus* var. *moestus*, a fairly large black one, and *fuliginosus*, rather smaller and narrower; *prasinus*, with blue, red and green colouring, and the pale-legged *albipes*. Very similar to *A. marginatus*, at first sight, is *Chlaenius vestitus*, which occasionally occurs abundantly in such a situation, but can be easily detected by the white apex of the elytra, and more pubescent aspect. Among these, *Elaphrus riparius* and *cupreus*, with their coarsely shagreened elytra, may dart; they are very splendid, irisated beetles, the former bronze-green, and the latter dark-purplish, with tiny raised patches or warts on their backs. As regards the smaller fry of the carnivorous beetles, one finds plenty of sport among the long genus *Bembidium*, which includes forms of our smallest GEODEPHAGA, and is, like *Apion*, so uniform in shape, and, to a great extent, in size and coloration, that its uncommon and rare members are always in great requisition among coleopterists. To see many *Bembidium minimum* racing about, tiny flashes of metallic blue, over the dark mud, is a very pretty sight, and one that may often be repeated, as the insect is among the commonest of the genus, as well as the smallest. Of the BRACHELYTRA we find on the surface of the mud, there is a very great number, many species of *Homalota*, *Philonthus*, *Stenus*, and *Lathrobium*, being exclusively taken there. What the peculiar fascination of the mud is for these beetles is not well known, but I think it is, probably, for the most part, the old tale of "Big fleas and little fleas." It will be noticed that almost all the species found on it are voracious; the tiniest probably go to pick up what they can of the organisms evaporation leaves helpless and exposed upon the bare mud-surface; larger species go to pick up the tiniest, and "so *ad infinitum*." It can hardly be for the same reason that a fly will bask, in October, upon a sunlit fence for hours without moving—because the warmth is genial and vivifying to it—for these insects could be just as warm, and in as full reception of the sun's rays, in places where they never are found; although that they are far more abundant, and to be seen to the greatest advantage when the sun is hot, is indisputable, and a fact that is only true of those insects that inhabit places which are able to combine heat with a certain amount of moisture.*

* I have often noticed *Ceuthorrhynchus litura*, and other insects, in very dry places, apparently too paralyzed or exhausted to walk with their wonted becoming dignity by the heat of the mid-day sun beating full upon them, struggling, squirming, and wriggling as best they can to the mouth of rabbit-holes, and similar retreats, that they may roll down them, and so escape the strength of Sol.—C.M.

Homalota (Gynepta) caerulea is excessively abundant on the mud in the early spring, before the vegetation is sufficiently grown to afford good lodgment, and, later on, hundreds may be shaken out of the *Nasturtium* and pond-weeds. One *Stenus* more than others I have always noticed within a very few inches of the water, and never elsewhere; this is *nitidulusculus*, which is so like about fifty others, that one might pass it over as one of the commoner species, were it not for the situation in which it is invariably found. The species of *Lathrobium* appear to live on the town-and-country-house system, being found basking in the sun on the mud-flats in the "season," and securely ensconced in some warm corner at the base of the willows, on their margins, in the winter. *Prasocuris aucta* I have taken walking demurely along the surface of a drying ditch in a wood, and contrasting strikingly with the movements of *Bembidium biguttatum* that scampered about on all sides of them. Having metaphorically chased and secured such of the ones we want, as we are able, before they have disappeared down the cracks formed in the mud by its consolidation, we will next turn over what bits of board, sticks, and rubbish, generally the tide, or evaporation, may have conveniently left for our advantage. Here we shall find *Pterostichus anthracinus*, *nitrita*, *strenuus*, and others of the genus, which, with *Clivina fossor*, dig out for themselves little chambers in the mud, much as a dog makes a bed for himself before lying down in a thick copse—by turning round and round, and tramping the soft mud into a hard floor, pushing the walls against the board which generally forms the roof of this curious little home. Other species which seek refuge by day beneath rejectamenta are the common *Prasocures*, *Erirehinus acridulus*, and one or two damp-loving species of *Ocypus*. Here *Heteroceri*, *Bledii*, *Dyschirii*, whose larvæ subsist upon those of the two former, and *Aphodius plagiatus* have their subterranean burrows, and *Badister unipustulatus* should be sought for. The ecdysis of nearly all the voracious water-beetles, as well as of some GEODEPHAGA and BRACHELYTRA, takes place within the mud of the margin, and the pupa is securely tucked away from the outside world. A pond that has become completely dry is still often a good locality for HYDRADEPHAGA, which do not, as one would suppose, take wing to another pond immediately, but may often be found an inch or two deep in the mud. In this manner I have taken several species of *Agabus*, and, in brackish water, *A. conspersus*. It is very probable that many species of water-beetles pass the coldest part of the winter, although they seem to hold the thermometer in less respect than most insects, quiescently in the ooze. I found a colony of *Agabus paludosus* and *Parnus auriculatus* under the damp, mud-covered bark of an old post standing in a running stream, last February, and thought it a very unusual situation for such essentially aquatic insects. One can hardly pass without noticing those brilliantly bronze GEODEPHAGA, so common on the mud of all salt-water marshes, running about in what is termed a "somewhat aimless way," by Mr. Walker, who goes on to say, of all three species of the genus *Pogonius*: "Here (Isle of Sheppey) they were to be found, each beetle sitting with its head just at the level of the soil, in a vertical burrow about half an inch deep; the earth being thrown out round the mouth of the burrow in a granular form, as by a sand-hopper, or a *Bledius*, only in much more regular fashion" (*E.M.M.*, June, 1896). What is technically known as "swilling"

often yields good things. Many beetles, especially the PALPICORNIA and Parnidae, although, when feasible, they prefer aquatic plants, in their absence will often sit just at the water's level on the mud at the side of the pond, and may be washed off by throwing water on the mud, and, as it runs back, it will bring with it a host of little beetles, all struggling in protestation, into the water, whence they may be bottled at leisure. Of the mud beneath the water, and the curious, complex, and varied forms of insect-organisms there to be met with, I will say nothing; merely trusting I have shown that another of the barren places of the earth teems with life for those who care to look for it.

Contributions to the fauna of the Dauphiné Alps.

II.—THE MOTHS OF LE LAUTARET.

By J. W. TUTT, F.E.S.

The moths received nothing like so much attention as the butterflies (*vide, ante*, vol. viii., p. 253 *et seq.*) during my stay at Le Lautaret. They are less easy, too, as a rule, to observe, and, being less familiar, the peculiarities of their habits are apt to be more overlooked. However, meagre as my notes are, I trust they will interest British entomologists, especially those relating to what are also British species.

INCOMPLETÆ. ZYGÆNIDES. — *Procris heydenreichii*, Ld. — Staudinger gives two species of this genus as inhabiting the Alps, *viz.*, *P. statice* var. *heydenreichii* and *P. geryon* var. *chrysocephala*. I should not like to have to say for certain that the large male and two small females which I captured here were specifically identical with either of these well-known British species. Certainly they are not *P. geryon* var. *chrysocephala*, but they probably are referable to Lederer's var. *heydenreichii*, which is diagnosed by Staudinger as:—"Var. major, al. ant. cæruleis; al. post. aterrimis." Whilst acknowledging this, it must not be supposed that I do not strongly suspect that *heydenreichii* is specifically distinct from *statice*. I observe that Staudinger notes—"sp., Darw.?" *Zygaena exulans*.—In the utmost profusion, even on the grass plot on which the "dependance" of the Hospice is built. On the slopes from 7,000 to 8,500 feet, the imagines were in incredible abundance, whilst the cocoons were equally so on the stems of juniper, grass, and everything else, indeed, on the mountain side. Sometimes five or six cocoons were placed altogether, partly on one another, so abundant were they. The cocoon is a very feeble structure compared with those of the other species with which I had hitherto been familiar. On the high skrees, 9,000 ft., the species was still abundant, but decidedly smaller (as might be expected in such an inhospitable place), although quite up to those from the lower and more luxuriantly clothed slopes, in colour. The variation in the specimens is simply marvellous. The following of the named forms appear to have been taken:—(1) The type, in great abundance. (2) ab. *vanadis* (= ab. *subochracea*, White) rarer in the male than among the females. (3) ab. *clara*, decidedly rare. (4) ab. *flavilinea*, moderately common.* Besides these, I have a number of specimens almost unpigmented, pallid in hue, the forewings whitish, and the ordinary red spots very washed out in appear-

* These forms are all fully described *Ent. Rec.*, vol. v., pp. 258-267.

ance (=ab. *pallida*). A number of specimens in which the red blotches of the fore-wings are more or less united, to form streaks (=ab. *striata*). Lastly, a grand ♀ aberration of what might have been the *flavilinea* form, had not an unaccountable development in the direction of *Z. minos*, turned it into a specimen quite unique in my experience. It is of large size, with the centre of the forewings entirely crimson, the whole of the spots thus enlarged being united, except for the fine lines which run along the subcostal and radial nervures, and just separate the blotch into the three portions characteristic of *Z. minos*. *Zygaena minos*.—Only two specimens observed, and these at a distance of at least a mile from each other, at a height of about 8,000 feet. Both, too, were worn. *Zygaena transalpina*.—This species puzzled me. On the morning that I left Lautaret I scaled the slopes at the back of the Hospice, hoping to find something fresh on the high skrees. I had reached nearly 9,000 ft., and was slowly leaving behind me the species of the lower slopes, when, on the rough ground, I suddenly came across a colony of this species, of average size and colour, and in the best of condition. The insect remained abundant at the greatest height to which I reached.

TORTRICIDES.—*Tortrix* (?) *viburniana*.—Dr. Chapman and myself are quite of opinion that this insect, which is so abundant at Le Lautaret, is not co-specific with our moorland species that goes by this name. On specimens being submitted to Mr. Durrant, he writes:—"At present these must be called *viburniana*, but it is very probable that more than one species is doing duty under that name." In July, 1894, Dr. Chapman obtained larvæ here, I believe, and bred the insect. I, unfortunately, got no females. The males flew freely in the morning sun, from about 9-11 a.m. *Catoptria hypericana*.—A single example, quite indistinguishable from examples caught on the Kent chalk-hills. *Sericoris rivulana*.—Rather abundant, but worn. No difference from British specimens. *Aphelia argentana*.—The most abundant Tortricid. It was disturbed among the long herbage everywhere, but most difficult to get perfect. I dare say a hundred specimens passed through my net for about half a dozen moderately perfect individuals worth setting.

TINEIDÆ?—*Butalis fallacella*, Schl.—One specimen only, named by Lord Walsingham. I believe it was swept up from the herbage.

PTEROPHORIDÆ.—*Oxyptilus kollari*.—One specimen only captured. *Platyptilia metzneri*.—Captured among *Petasitis*, and difficult to distinguish from *P. gonodactyla*, to which I should have referred it without hesitation. I have compared it, however, with Frey's specimen of *metzneri*, and it agrees absolutely. *Mimaesoptilus stigmatodactylus*, *M. pelidnodactylus* (*nictodactylus*, Frey), and *M. coprodactylus*. *Mimaesoptili* were exceedingly abundant, and at the time of catching them I thought, as they were very similar, and had exactly the same habits, that the specimens were all of one species. Comparison, however, with Frey's insects in the British Museum, shows that the above species at least are represented among my captures. *Acipitilia tetradactyla*.—Not very common, but pretty generally distributed on all the flowery pasturages about the Hospice.

OBTECTÆ - PYRALOIDS. — GELECHIDÆ. — *Sophronia semicostella*, Hb. (*parenthesella*, Haw.).—Occasional specimens were observed; very similar to British examples. *Pleurota pyropella*.—

I only brought one or two specimens home, although the species was common. Of the specimen submitted to Lord Walsingham, he writes:—"On the strength of a single specimen, I cannot separate this from some of the forms of *pyropella*, and believe it to be that species." *Oecophora stipella*.—One very pale specimen only, named by Mr. Durrant. I have a large number of this species from Glasgow, and, speaking from memory, believe I was told that it had some connection with sycamore. I only mention this as, either my information must have been all wrong, or the probability of there being two species mixed under this name must be very great. *Gelechia spurcella*.—A single specimen, named by Lord Walsingham. *Gelechia samadensis*.—Another single specimen, named by Lord Walsingham, probably the best capture made. The specimen is in good condition, and is now in Lord Walsingham's collection.

PHYCITIDES.—*Pempelia ornatella*.—A large form, with the fore-wings of a greenish-ochreous hue, and presenting some little variation in the shape of the white transverse line of the fore-wings, was not uncommon. Disturbed from the herbage by day. *Pempelia fusca*.—A single specimen, which must, I think, be this species. *Catastia marginæa* ab. *auriciliella*.—A single specimen only, taken when flying in the sunshine.

CRAMBIDES.—*Crambus radiellus*.—Generally distributed on the highest grassy pastures. The nearness of this species to *C. furcatellus* leads me to suggest that our British collectors should be on the look out for specimens with the streak rather broader, more continuous, and with the fringes of the fore-wings chequered strongly, opposite the streak, with pale. *Crambus conchellus*.—A few, the ground-colour of the fore-wings rather pale. *Crambus culmellus*.—Exceedingly abundant. On the wing in the early morning in amazing numbers, flying even in the rain. *Crambus pascuellus*.—Only an odd specimen or two observed. Probably more abundant than this statement would appear to warrant.

PYRALIDES.—*Botys austriacalis*.—Exceedingly abundant. The females much smaller than the males, and usually in better condition. *Botys aerealis* var. *opacalis*.—Abundant, the males of a much paler ground-colour than the females, the latter also with a well-marked conspicuous yellowish transverse band, parallel to the hind margin of the fore-wings. Like the last species, the female much smaller. *Botys alpinalis* var. *uliginosalis*.—In Staudinger's *Catalogue*, p. 208, these are treated as two distinct species, of which the former is given as inhabiting "the Alps and Altai," the latter "the Alps, Hungarian Mountains, Scotland and Galicia." The specimens at Lautaret are identical with those from Scotland. *Heryna phrygialis*.—This dingy black-grey species was only observed sparingly. *Heryna alpestralis*.—Not at all common. *Stenopteryx noctuella* (*hybridalis*).—Fairly abundant. All the specimens of a dull-coloured and ill-marked form. *Scoparia suletica*.—Settled on the rocks. Fairly common.

OBTECTÆ-MACROS.—GEOMETRIDES.—*Tanagra atrata* (*chaerophyllata*).—Large, in fine condition, and in great abundance. Flies somewhat feebly, just above the herbage, in the morning sunshine. Both sexes were on the move between 9 and 11 a.m. *Psodos coracina*.—Widely distributed, but not abundant. The specimens I captured are small, intensely black, and in perfect condition. They are quite

unlike any of the specimens of this species, and the allied *P. trepidaria* in the British Museum (South Kensington) collection, and are, perhaps, referable to the latter, and not the former species. Their fine condition and comparative rarity suggest that the species was not fully out. *Pygmaena fusca*.—The males of this strange Geometrid moth were common, flying lazily in the sun when disturbed, and reminding one of a Psychid in habit. I knew nothing of the somewhat semi-apterous condition of the females at the time, or I would have made a special search for a specimen. *Larentia olivata* and *L. aptata*.—I cannot separate some specimens of these so-called species, but believe my specimens to be the former. *Cleogene lutearia*.—This large orange-coloured moth was in great abundance, and in the most perfect condition, easily disturbed in the daytime, but not flying far. The females, with their paler-coloured and smaller wings, were less readily induced to move. The sexual dimorphism and habit of this species remind one very much of *Aspilates strigillaria* (and, indeed, of *A. ochrearia* and *A. gilvaria*). *Strenia immorata*.—I was astonished to find this insect so far above the tree limit. The specimens captured appear to differ in no way from our British examples. I am quite convinced, after having seen this species in nature, that it is exceedingly close to *S. clathrata*. It was nowhere abundant, but was disturbed here and there over a wide tract of country. *Acidalia mutata*.—Only one example of this large *promutata*-looking species. It really is most absurd to keep this and the next species in the same genus. *Acidalia flaveolaria*.—This beautiful little species, with its orange wings and black fringes, was very abundant, and generally distributed. It flew freely in the early morning, even in the rain, with *Crambus culmellus*; it was also easily disturbed later in the day by walking through herbage.

NOCTUIDES. — *Euclidia glyphica*.—Only one specimen, which, although not worn, has all the wings peculiarly bleached. *Plusia hoeneuwarthi*.—One fine specimen of this beautiful little yellow underwing, with its Plusiid-like mark in the centre of the upper wing, was caught whilst flying in the daytime.

CHELONIDES.—*Nemophila plantaginis*.—Very few specimens were observed, and these were flying so wildly that still fewer were captured. These, however, included the type, *ab. hospita* and *ab. matronalis*. *Setina irrorella*.—A few typical specimens were captured, and a few of the *ab. andereggii*.

BOMBYCIDES.—*Clisiocampa alpicola*.—The larvæ and pupæ were not uncommon, the former feeding on *Petasitis*, the latter, in cocoons, spun up on the undersides of the leaves.

I can scarcely conclude these brief notes without calling attention to a most striking fact, *viz.*, how large a percentage of species at these high altitudes are of one (or of a combination) of the three colours—black (and blackish-brown), yellow, and white. There is no need to go through the whole list to illustrate the point, which will, indeed, be patent to all who know the species.

SCIENTIFIC NOTES AND OBSERVATIONS.

RESPIRATION IN THE CULICIDÆ.*—The account (of the respiration of *Culex*) by Miall, in his recently published *Natural History of*

* L. O. Howard, from *The Principal Household Insects of the United States*, 1896

Aquatic Insects, is misleading, for the reason that he assumes that the end of the body, with its four (or, as he has it, five) leaf-like expansions, is the breathing organ. As a matter of fact, this end of the body does not reach the surface, and it is the tip of the respiratory siphon only which is extended to the air. This respiratory tube takes its origin from the tip of the eighth abdominal segment, and the very large tracheæ can be seen extending to its extremity where they have a double orifice. The ninth segment of the abdomen is armed at the tip with four flaps and six hairs. These flaps are gill-like in appearance, though they are probably simply locomotory in function. With so remarkably developed an apparatus for direct air breathing, there is no necessity for gill structures. Raschke and Hurst consider that the larva breathes both by the anus and by these gill flaps, as well as by the large tracheæ which open at the tip of the respiratory tube. Raschke considers that these tracheæ are so unnecessarily large that they possess a hydrostatic function. The writer is inclined to believe that the gill flaps may be functional as branchial structures in the young larva, but that they largely lose this office in later life.—L. O. HOWARD, N.S. Dept. Agr., Washington.

† Raschke, *Die Larve von Culex nemorosus*, Berlin, 1887.

** Hurst, *The Pupal Stage of Culex*, Manchester, 1890.

NOTES ON COLLECTING, Etc.

NOTES FROM THE WEST OF SCOTLAND.—The spring (1896) was very cold, and the prevailing east winds prevented insects from being on the wing. Sugar was of no use, and the few insects I obtained at the shallows were only of the very common order, such as *Anticlea badiata*, *Cilaria suffumata* and *Taenioecampa gothica*. About the middle of May the weather took a sudden change, and then commenced the disappointments. Everything must have come out with a rush, and when I went for many of the things I intended taking, I found that I was too late. On May 21st I made a run up the West Highland Railway to Ardlui, at the head of Loch Lomond, expressly for *Scopula decrepitata*, which for the last three years has been in fine condition at that date. All I got were two very poor specimens, after many hours of diligent searching. *Hydrelia unca*, which I have taken there, was also over, three being the total, with two or three specimens each of *Phaenidia mi*, *Phytometra acnea*, *Eupithecia satyrata*, *Coremia propugnata* and *Melanippe tristata*, and also two fine *Emmelesia adaequata* (*blandiata*), which is just about a month before its usual time. June was undoubtedly the best month here, but, as sugar would not attract insects, I confined myself to the smaller species. *Dichrorhampha herbosana* occurred in greater numbers than I have previously observed. *O. antiquana* and *Platyptilia pallidactyla* (*bertrami*), a few *Mimaeseoptilus pterodactylus*, and *Platyptilia gonodactyla*, common. *Phycis fusca* (*carbonariella*) in some numbers at Bishopton, but *Sciaphila octomaculana* was very scarce; the 23rd was the only evening that sugar attracted insects out of a number of nights I tried it, but it was only the common herd which put in an appearance—*Miana fasciuncula*, *Agrotis exclamatoris*, *Nyctophasia rurea*, and one *Apanaea gemina*. The *Plusias* have also been scarce this year, but I got one *Plusia bractea*, from which I have at present a batch of young larvæ. I have tried

to force them to feed up with heat, but they seem determined to hibernate. Perhaps some of your readers will be able to give a few hints as to how they should be carried over the winter? I spent my holidays in July this year at Ravenscraig, in Renfrewshire, and never had such a wretched fortnight's collecting. The evenings were cold, with an east wind almost blowing a gale all the time. *Dasydia obfuscata* was over when I got there on the 17th, only three being obtained at rest. *Carsia paludata* var. *imbutata*, *Larentia olivata*, *L. caesiata* and *Coremia minutata* were all very scarce; *Hypsipetes elutata* very abundant, and of which I obtained a few fine red aberrations. Single specimens of *Plusia festucae*, *Celaena haworthii* and *Lycophotia strigula* (*porphyrea*) were netted. Sugar would not attract Noctuids, nothing but centipedes, snails and earwigs. *Pamplusia mercuriana* (*monticolana*) was common; *Tortrix viburniana* and *Amphisa gerningana* scarce. *Chrysophanus phlaeas*, *Polyommatus icarus*, and *Aglais urticae* were all the Diurni I took. *A. urticae* was going into hibernation at that early date, several being seen in the house, and I have not seen a single specimen on the wing since then. In August, *Polia chi* was common on the walls, closer to the city than usual. *Anchocelis litura*, *Citria fulvago* and *C. flavago* scarce. I obtained a good number of larvæ of *Eupithecia helveticata* from the juniper, but 50% at least were ichneumonised. In September, about the only insect taken was *Tapinostola fulva*. I made one journey for *Phibalapteryx lapidata* to the Lanarkshire hills, and obtained about two dozen; only about half of them were worth setting. I spent four days at Ardlui at the end of the month, and sugared every evening. I obtained two *Miselia oxyacanthæ*, one *Orrhodia vaccinii*, one *Calocampa vetusta* and one *Euplexia lucipara* (second brood). The larvæ of *Phalera bucephala* had been very common there; whole willow bushes, and large branches of oak and alder being stripped of their foliage.—A. ADIE DALGLISH, 40, Princes Street, Pollokshields, Glasgow.

COLLECTING ON THE EAST COAST OF SCOTLAND.—The season (1896) opened here about the last week of March, when hibernating larvæ of *Bombyx rubi*, *Spilosoma fuliginosa* and *Bombyx callunæ* began to put in an appearance, followed a month later by those of *Nemeophila plantaginis*, *Dasychira fasciata*, *Trichiura crataegi* and *Noctua neglecta* in some numbers. The most noteworthy feature about the spring larvæ was the great abundance of *Arctia caia*, which actually swarmed everywhere throughout the north-east of Scotland. In Orkney I found them in extraordinary numbers, crawling across the road between Kirkwall and Stromness, many of them crushed by foot-passengers and passing vehicles. Hitherto, I have found a few larvæ of *Plusia interrogationis* on heather, every year, but this season not a single one turned up. Sallows began to work about the first week of April, the usual *Tæniocampids* were common, *Panolis piniperda* especially so. Of this a few green forms were taken, also some nice banded and variegated *Tæniocampa instabilis*. On April 18th I netted a single specimen of *Brephos parthenias* in the Blackhall Woods, Kincardineshire, which is only the third recorded specimen for this district, and the first for that county. Sugar during May was, with the exception of a very few *Hadena glauca*, *Phaëtra menyanthidis* and *Mamestra albicollis*, almost blank. During June it paid much better. *Hadena rectilinea*, *H. adusta*, *Noctua brunnea*, *Apamea gemina*, and

other common things turned up rather freely. *Cymatophora duplaris*, *Acronicta leporina*, *Aplecta herbida*, and one or two others, were decidedly scarce. *Dianthoecia conspersa* was netted at campion flowers on the Kincardineshire coast, but they were generally scarce. During July, August, and up to this date, sugar has been an absolute failure. This is all the more regrettable from the fact that it is usually most productive there. I never, in any previous season, experienced such a complete dearth of insects. However, when I found that sugar was not a success, I turned my attention to flowers, and captured a nice series of *Noctua sobrina*, *Agrotis simulans* (*pyrophila*), *A. lucerneae*, *Miana literosa*, *Triphaena orbona* (*comes*), and its aberrations, *Caradrina taraxaci* (*blanda*), *Mamestra furva*, *Noctua dahlii*, etc. At Muchalls, on the Kincardineshire coast, I succeeded in capturing a few beautiful *Plusia bractea*, being my first acquaintance with this insect in a living state. The Agrotids on the sand-hills have been conspicuous by their entire absence; not one turned up at sugar, marram grass or ragwort. Butterflies, generally, were fairly represented, so far as they go in this part of the world. Taken altogether, this has been undoubtedly the worst season that I have ever experienced. Many good species that usually turn up in greater or less numbers failed this year to put in an appearance in any shape or form.—ARTHUR HORNE, Aberdeen.

COLLECTING AT PORTLAND, ETC.—My experiences have this year (1896) been rather limited, but, so far as I have seen, the season in this neighbourhood has been bad. The genus *Agrotis*, at Portland, has been scarcer than usual, very few *A. lucerneae*, fewer *A. lunigera*, and no *A. pyrophila* have occurred, and the commoner Noctuids were not in their usual numbers. Geometrides also were not abundant. I cannot call it a good Micro year; but I think they fared better than the Macros. *Ennychia cingulalis*, which I have found very irregular in its appearance at Portland, was commoner than usual, as was also *Scoparia mercurella* and its var. *portlandica*. On the other hand, *Phycis dibutella* was scarce, and *Epischivia banksiella* very scarce. I obtained a good series of two species, of which I have before taken only two or three odd specimens, viz., *Gelechia distinctella* and *Lita salicorniae*. *Tinea subtilella* was rather commoner than usual, but the other little Portland species, *T. vinculella*, which has now turned up in Purbeck, was scarce.—N. M. RICHARDSON.

IVY IN DEVONSHIRE.—There was a fair number of visitors at ivy from the beginning until the third week of October. Six *Tiliacea* (*Xanthia*) *aurago* turned up, three males somewhat worn, three females in fine condition. I suppose they come out a little later and fly less. I am keeping (Oct. 25th) the latter for eggs, and find that they lay generally on the stems of the branches of beech, especially in the axils of the leaves and shoots, and rarely scatter their eggs on the muslin, as so many other moths do in confinement—*Anchocelis rufina* for instance. This latter is a famous layer, much more prolific than I have found *T. aurago*. *Orthosia lota* has been abundant, with a good many of the red form, ab. *rufa*, which, I think, is only taken in the south. *O. macilenta* is, as usual, to the fore in numbers, with the usual variations. *Orrhodia vaccinii* and *O. ligula* seem very scarce, especially the latter, and only a few *Miselia oryzaecanthae* have put in an appearance. *Udaria siterata* is also

scarcer than usual. *Xylina ornithopus* and *X. socia* turned up during the third week in October. I find that the latter rarely, if ever, comes to ivy till late in October, the specimens being then perfectly fresh.—W. S. RIDING, M.D., F.E.S., Buckerell, nr. Honiton, Devon.

LARVÆ IN THE NEW FOREST.—The chief points of the New Forest collecting (1896) appear to me to have been the abundance of *Hylophila quercana*, and of the larvæ of *Asphalia ridens* considerably fewer than usual, whilst the larvæ of *Boarmia roboraria* and *Tephrosia extersaria* were plentiful in the autumn, and *Lithosia deplana* and *Aventia flexula* have been bred freely. Sugar, except for *Noctua rhomboidea* and the "Crimsons," has been a consistent failure.—J. C. MOBERLY, M.A., F.E.S., 9, Rockstone Place, Southampton.

INSECTS AT HAMPSTEAD.—Referring to Mr. Newbery's note (*ante*, vol. viii, p. 216), I may mention that I have found *Catocala nupta* fairly common on Hampstead Heath. Some four or five years ago (I have not my note book to refer to at the moment) I secured a fine series at sugar on the West Heath, and I have also obtained them by the same means in my garden at 132, Haverstock Hill. As regards *Cossus ligniperda*, I have a specimen (unfortunately slightly crippled), bred from a larva found at North End, Hampstead, in 1884, and I have heard of the species being taken in the neighbourhood several times. The ravages of the larva are to be seen on a great number of the willows on the heath.—H. AINSLIE HILL, F.E.S., 9, Addison Mansions, Kensington, W. November, 1896.

NOCTUA DITRAPEZIUM IN SOUTH YORKSHIRE?—In the report of the meeting of the South London Entomological Society, held on September 24th, Mr. Montgomery is stated to have exhibited specimens of *Noctua ditrapezium* from South Yorkshire. If this statement is correct, it is a very interesting record, as it is not included in Mr. G. T. Porritt's *List of Yorkshire Lepidoptera*, published in 1888, nor have I ever seen or heard of a Yorkshire example. I might add that I know the South Yorkshire (indeed, all the Yorkshire) collectors and collections well, and am constantly seeing and hearing from them, so feel sure that, had such an interesting species been captured, I should have been advised. As one of the honorary secretaries of the Yorkshire Naturalists' Union, I should feel extremely obliged to Mr. Montgomery if he would inform me when, where, and by whom taken. If desired, I would keep the locality secret.—W. HEWETT, 12, Howard Street, York.

FOOD-PLANTS OF ZEUZERA AESCULI.—Our garden being overrun with *Zeuzera aesculi*, I think it may be interesting to give a list of the trees, etc., attacked by the larvæ. Some of them, I think, are unusual and extraordinary. They are:—sycamore, pear, apple, hawthorn, ash, elm, hazel, silver-birch, lilac, mountain-ash, privet, laurel, yellow jasmine and honeysuckle. We have never found them attacking poplar, though both Mr. Barrett and the Rev. J. Seymour St. John mention it in their works.—J. F. BRID, Rosedale, 162, Dalling Road, Hammer-smith, W. December 2nd, 1896.

EUVANESSA ANTIOPA IN ABERDEENSHIRE.—I have pleasure in recording the capture of *Euwanessa antiopa* in Aberdeenshire, on October 4th, 1896, between Logierieve and Esslemont, on the G.N.S. Railway line. It was caught by Mr. Youngson, a mason, who unfortunately was not a collector, therefore the insect was a little damaged. There can be

no question about its being a British specimen, as the border of its wings are almost pure white. I have seen this insect myself, and as I have a few Continental specimens of *P. antiopa*, I have no doubt about it being British. It is now in possession of Mr. Cran, of Ellon, a young collector. Mr. Cran told me that about six weeks before this one was taken, he saw one of this same species rise from the top of a small willow tree, and, although he was within a yard of it, lost it, owing to not having his net. Perhaps this may have been the same insect, as Ellon is only three miles from Logierie. This is the second specimen of this rare insect which has been caught in Aberdeenshire this season. The other is recorded *ante*, vol. viii., p. 310.—Wm. Cowie, 5, Canal Street, Aberdeen. October 29th, 1896. [Mr. Horne has also sent a "cutting" from the *Buchan Observer* relating to the same insect.—Ed.]

PORTHETRIA DISPAR AS A BRITISH INSECT.—The editor's account of the habits of this species, as investigated by him at Aix-les-Bains and Bourg d'Aru, is most interesting, and is the excuse for my writing to ask whence the present (so-called British) race of *P. dispar* originated. It would take a good deal to convince me that it is derived from the "old Fen strain," which must have been extinct in England for at least 25 years. If, as is popularly supposed, the present race is of Continental (European) origin, I must protest against the very casual way in which nine out of every ten entomologists admit a series into their cabinets without labelling it as foreign. Personally, I would not allow one to be seen on my premises! Most, if not all, dealers include it in their catalogues, and price it among British species. Only last month, I happened to be "talking entomology" with a dealer, whose insects are beyond suspicion British, and in reply to a question of mine, as to why he included *P. dispar* in his list, he said he supposed that everyone knew it was of foreign origin. Surely this is hardly a satisfactory state of affairs, especially as the slipshod admission of these foreign *P. dispar* into nearly every English cabinet, is rather apt to detract from the value of the few genuine old *P. dispar* which still survive, and, I take it, they are not very many. Moreover, many beginners and collectors, residing in the country, admit these *P. dispar* into their collections under the impression that they are British. Only this May I met an entomologist, hailing from Robin Hood's county in a well known Midland wood, and during our confabulation he informed me that he had lately got a new cabinet, and was re-arranging his collection. When I suggested that he should not insert a foreign series of *P. dispar*, you would hardly believe what a long face he pulled. It has haunted me almost ever since. The bare idea of eschewing a series of the "Gipsy moth" was a great deal too much for his equanimity, and he went away, if not a wiser, yet perhaps, a sadder man.—(Rev.) G. H. RAYNOR, B.A., Hazeleigh Rectory, Maldon, Essex. Dec., 1896.

APLECTA ADVENA AND XANTHIA AURAGO.—*Aplecta advena* was very abundant, though rather worn, this spring, in the same locality as it occurred last year. It came very freely to the flowers of bladder campion, *Silene inflata*. What is the food-plant of the larva? "Lettuce and garden herbs" are given by Newman. I have recently taken ten specimens of *Xanthia aurago* (six in lovely condition) on ivy here. Until this year I have only taken it singly, and in widely-separated

localities. This year I took all but one on a small patch of ivy on an old wall.—T. GREER, Bath. Oct. 15th, 1896.

DOUBLE BROODS.—Referring to the Rev. C. R. N. Burrows' article (*ante*, vol. viii., p. 216), I do not see anything very remarkable in many of the occurrences he records. In this district many of the insects mentioned are invariably double-brooded. For instance, *Cyaniris argyolus* is well known, I believe, to be universally double-brooded, and the same may be said of *Agrotis puta*, *Drepana hamula*, *Cilix spinula*, *Strenia clathrata*, *Polyommatus astrarche*, *Macaria notata*, *Ligilia alustata*, *Lophopteryx camolina*, *Noctua c-nigrum*, *Cidaria truncata*, *Phaeretra runcicis*, *Noctua rubi*, *Zonosoma annulata*, *Z. porata*, *Z. punctaria*, *Z. orbicularia*, *Anaitis plagiata*, *Acidalia marginepunctata*, (*promutata*) (out of doors), *Hadena trifolii* (partially), *Agrotis saucia*, *A. segetum*, *Plusia chrysis* and *Leucania pallens*. *Timandra amatoria* is always partially double-brooded in hot years, also *Brenthis (A.) selene*, *Dianthoeia capsicola*, *D. eucubali* and *Phibalapteryx vitalbata*. *Geometra papilionaria* and *Acidalia aversata* remain so very long on the wing that I can hardly recognise the fact of second broods, as the larvæ hybernate so early—my dates for the former range from the middle of June to the end of August, and those of *A. aversata* are very similar. There must be some mistake about *Noctua baia*, as it is an autumnal insect, as is also *Crambus pinetellus*—and my experience of *Acidalia inornata* is the same as regards *A. aversata*. *Orygia gonostigma* is surely a retarded emergence, but here we have always at least three broods of *Humia crataegata* and *Melanippe fluctuata*. I once met with the third brood of *Polyommatus astrarche*, in the hot season of 1884. The apparent double brood of *Agrotis suffusa* may be explained by the fact that it hibernates. I have repeatedly taken it at fallow bloom.—C. FENN, F.E.S., Eversden House, Burnt Ash Hill, Lee, S.E.—[*Noctua baia* occurred commonly in early July, and *Crambus pinetellus* in late June, at Chattenden. From eggs of *Acidalia inornata*, laid in July, Mr. Bacot sent me pupæ which emerged in early September this year.—E.D.]

I have observed second broods of the following species:—*Tephrosia bistortata* (*crepuscularia*), very common, early; *Drepana binaria*, *D. falcata*, *Acidalia imitaria*, *Lobophora rivetata*, *Coremia designata*, *Aspilates ochrearia*, *Melanthia ocellata*, *Larentia viridaria*. I took in August, too, several quite fresh *Cleora lichenaria*, and, on September 9th, got a very fine *Melanippe galiata*. These, I suppose, would be second broods. It is curious that of *D. unguicula*, *Selenia lunaria* and *S. tetralunaria*, which are normally double-brooded, and of which the two first were unusually plentiful as a first brood, I have seen no second.—E. F. STUDD, M.A., B.C.L., F.E.S., Oxtou, Exeter.

Of unusual second broods, a few *Pericallia syringaria* were bred in sleeves out of doors and one *Timandra amatoria*, from a batch of larvæ which are now hibernating.—W. M. CHRISTY, M.A., F.E.S., Ennswoth.

I bred a complete second brood of *Acidalia marginepunctata* (*promutata*), which I believe is not unusual, but I was surprised to breed an almost complete second brood of *Stauropus fagi* (only two pupæ lying over), and, unfortunately, not expecting them to emerge before next spring, the majority of them knocked themselves to pieces before I knew that they were out; the larvæ fed up very fast. They hatched about June 1st, and by the end of the month most of them had spun up.—A. W. MERA, 79, Capel Road, Forest Gate, E.

Plusia moneta has appeared here, as a second brood at large this year.—SYDNEY WEBB, Dover.

I was shown *Smerinthus populi* in its second skin two days ago taken here (Oct., '96), and given ova of *Epione apiciaria*, a third brood. Of *P. moneta* I took five larvæ at Ascot, in July, and three more were found on the same plants a fortnight later. With the exception of the second brood of *Cyaniris argiolus*, I fancy butterflies were very rare hereabouts.—E. A. BOWLES, M.A., F.E.S., Waltham Cross.

PLUSIA MONETA AND CIRRHEDIA XERAMPHELINA AT WATFORD.—On the 19th June last, I captured a specimen of *Plusia moneta* flying over honeysuckle in the garden of my friend, Mr. C. E. Fry, here. On the 31st August, Mr. Spencer, Junr., and I each took a specimen of *Cirrhoedia xerampelina* at light.—ARTHUR COTTAM, Ildercroft, Watford.

SPHINX CONVULVULI AT CLEVEDON.—I have only seen one specimen of *S. convulvuli* this season, and failed to capture it.—J. MASON, Clevedon Court Lodge, Somerset.

ACHERONTIA ATROPOS.—Five larvæ of *Acherontia atropos* have been brought to me, and I have heard of several others.—(Rev.) C. D. ASH, M.A., Skipwith Vicarage, Yorks.

Acherontia atropos turned up here in most unusual numbers. I had twelve larvæ and one pupa brought me by the field workers, but up to October 1st none have emerged, although two are changing colour. It seems to be a very ill-regulated animal as regards its emergence. I have had them emerge in November, April and July, the last nearly a year in pupa.—E. AUGUSTUS BOWLES, M.A., F.E.S., Waltham Cross.

I have had one *A. atropos* from Emsworth.—W. M. CHRISTY, M.A., F.E.S., Emsworth.

ACHERONTIA ATROPOS IN 1896.—I know of two larvæ of *Acherontia atropos*, taken here. One I secured, the other was chopped in two by the finder, as an object too dreadful to be allowed to live.—J. MASON, Clevedon Court Lodge, Somerset.

The larvæ of *A. atropos* have been unusually numerous around Bury St. Edmunds, and in the Eastern counties, feeding on potato and jasmine. The pupæ have also been numerous in one or two potato-fields. Several years ago, in Norfolk, I saw a potato-field, on light sandy soil, surrounded by Scotch-pine woods, in which every potato plant was eaten, and nothing but short stumps of stalks left, whilst the ground was completely covered by the footmarks and frass of *A. atropos* (as if a flock of pigmy sheep had been folded there till not a leaf was left).—F. NORGATE, 98, Queen's Road, Bury St. Edmunds.

One remarkable feature of this season has been the extraordinary abundance of larvæ of *Acherontia atropos*. I have seen about twenty-five larvæ myself, thirteen coming into my possession. The first full-grown larva brought to me this year came to hand on July 18th, and, strangely enough, on the same day a large battered imago was also given me by a friend, whose bees it had alarmed by entering one of his hives. This swarm appears to have been a weak one, and the moth put the bees to flight. On July 21st, another full-grown larva was brought to me, and others continued to come in during the month, and also during August, the last on August 27th. All were found on, or near, potato plants.—E. A. ATMORE, F.E.S., King's Lynn.

Several *Acherontia atropos* larvæ have been brought to me by potato gatherers.—H. H. CORBETT, M.R.C.S., 19, Hallgate, Doncaster.

SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.—Oct. 30th, 1896.—SOUTH AFRICAN INSECTS.—Mr. Rickard exhibited a number of South African insects, including various Orthoptera of *Phymateus* and allied genera, and Hymenoptera, and a specimen of *Batracho tetrica*, a very variable insect, whose colour is said to depend upon the nature of the ground in its neighbourhood. THYRIDOPTERYX EPHEMERIFORMIS.—Dr. Sharp showed various stages of *Thyridopteryx ephemeriformis* from Washington, U.S.A., including some perfect insects which had emerged after their arrival in England. JUMPING COCOONS.—Dr. Sharp read a paper upon "Jumping Cocoons." He described the structure of the pupa, and the mechanism by which it chisels and hammers its way out of the cocoon. He suggested that the "jumping" was produced by the efforts of the insect to free itself when the cocoon had by accident become detached from its moorings. Mr. Lamb remarked that the mechanics of the process were rather obscure.

COMMITTEE OF THE ENTOMOLOGICAL SOCIETY OF LONDON FOR THE PROTECTION OF BRITISH LEPIDOPTERA.—At a meeting, held on November 25th, it was resolved to invite the co-operation of local societies throughout the United Kingdom, and to ask them to furnish information as to proceedings likely to cause the extermination of local species of Lepidoptera. Communications will be received by the Hon. Secretary, CHAS. G. BARRETT, 39, Linden Grove, Nunhead.

REVIEWS AND NOTICES OF BOOKS.

HELP WANTED.—I am at work collecting the material for a book on *British Moths*, on the same lines as that recently published by Messrs. Gill and Sons on *British Butterflies*. I find there are descriptions of the eggs of very few species published, and that the existent descriptions of the pupæ are, as a rule, too meagre or general to be of actual value. I should be exceedingly pleased if entomologists generally will give me help in this direction, either by providing me with original notes on eggs and pupæ, or with eggs and pupæ for description. Larvæ, too, would be useful for original notes on structure. At present, the Hepialids, Cossids, Cochliopodids, Zygaenids, Lasiocampids, Saturniids and Sphingids are wanted. These will be the first groups dealt with, as they are the most unsatisfactory in Newman's work, and there appears to be no doubt that a cheap up-to-date book, on the lines of Newman, is much wanted by those lepidopterists to whom expensive books are prohibitive. Those lepidopterists, too, whose energy is spent among the foreign literature of our subject could greatly help by noting all aberrations and varieties they come across in the families mentioned above. Is it possible, too, to enlist the help of one (or more) good lepidopterist in each county, so as to get as complete a geographical distribution of the species as possible? Scotland is particularly ill-cared for in this direction. I should be particularly thankful for copies of any published county (or district) lists.—J. W. TUTT, Westcombe Hill, S.E.

ERRATUM.—Vol. viii., p. 299, line 5 from bottom, for "*B. quercus* going," read "*B. quercus* always going."

The Entomologist's Record

AND

JOURNAL OF VARIATION.

VOL. IX. No. 2.

FEBRUARY 15TH, 1897.

Some observations made in Switzerland, August, 1896.

Les Avants—Evolena—Arolla.

By H. ROWLAND BROWN, M.A., F.E.S.

British collectors, whose time of flitting is in August and September, have had lamentable weather this year (1896) in that happiest of hunting grounds, Switzerland, while from friends living on the spot, I hear no better accounts of the later autumn, when, to all intents and purposes, the collecting season for Rhopalocera is at an end. I left England on July 31st, arriving at Les Avants-sur-Montreux on Sunday, August 2nd, as beautiful a morning as the heart of an entomologist could desire; and as the carriage wound up the long zigzags from the lake of Geneva, I was soon in a veritable garden of Eden, the open lucerne and clover patches about the walnut trees on the town slopes presently merging into green coppices of beech and elder, about which the *Vanessidi* were sporting themselves in endless profusion; *Polygonia c-album*, *Aglais urticae* about the white elder flowers; *Limenitis camilla* skimming the hazel tops, with *Pararge egeria* in close attendance. Every thistle-head carried a brilliant Fritillary, and the red *Centaurea* was alive with dazzling "blues" and sleepy *Zygæids*. By the runnels at the roadside, *Polyommatus damon*, *P. corydon*, *Plebeius aegon*, *P. argus*, and an occasional *Polyommatus bellargus*, with not a few *Lycaena arion*, gave promise of sport in the future, while I noticed *Aporia crataegi* swinging from the great moon-daisies in scores. It was certainly a morning not to be easily forgotten, and the long series of wet days which followed until the 12th, when I made for the higher Alps, only accentuates the pleasure of its memory as I look back on the past summer. Les Avants, which stands 3,188 ft. above the sea level, and close upon 2,000 ft. above the lake, is situated upon an alp surrounded by beech woods and young firs; the Gorge du Chauderon beneath being also densely wooded. The carriage road from Montreux is continued in a narrowing way some distance toward the path which leads to the conspicuous Dent de Jaman (6,165 ft.), and further on the now too well known Roches de Naye (6,708 ft.). It was upon this road, and the mountains mentioned, that I made the few observations the weather permitted. Compared with the bewildering numbers of butterflies that are to be seen on the higher alpine ranges, these green mountain sides seemed less frequented; the absence of water, and consequent scarcity of pabulum, being, perhaps, responsible for the

difference. But I believe I am right in saying the fauna of the north side of the Lake of Geneva, in Canton Vaud, is considerably less numerous than on the Savoy side, while many of the commoner butterflies I have met with to the south I have not found in this part. In the cherry orchards, *Apatura iris* was supping on the ripe fruit, and occasionally descending to suck up the moisture from the road; *Leucophasia sinapis* was generally common, but the only *Erebia* was *E. aethiops*, a very bright form, displaying a great predilection for the wild parsnip heads. The Argynnidi were represented by *Dryas paphia*, with an occasional ab. *valesina*, *Argynnis aglaia*, *A. adippe*, with, higher up, *A. niobe*, *Brenthis euphrosyne*, *B. dia*, *Melitaea phoebe*, *Melanargia galatea*, in swarms, whenever the sun broke through the clouds; *Pararge maera* and *Hipparchia semele*, with *H. hermione* in attendance. Under the Col de Jaman I took four or five fine *Nomiades semiargus*, and a magnificent *Polyommatus dorylas*; but the commonest of all the *Lycaenuli* here, as at Evolena, was *P. damon*, the males very strong on the wing and large, the females less active, and much addicted to the wild mint flowers. *Parnassius apollo*, so common at higher elevations elsewhere, appeared to be rare. On August 12th, after ten days' almost continuous rain and mist, I started for Evolena, in the Val d'Hérens, walking up from Sion, in the Rhone Valley. The next day dawned cloudless, and a more beautiful road than that between Sion and Evolena, passing the famous pyramidal rocks, both generally speaking and from an entomological point of view, it would be hard to imagine. I have tramped nearly all the lateral valleys on this side of the Rhone Valley: the well-known Nicolaithal to Zermatt, the Saasthal; the Val d'Anniviers—a famous hunting ground; the dusty road from Martigny to the St. Bernard; but for exquisite flora and all winged creatures I give the palm to the Val d'Hérens, and I am borne out in my conclusion, I think, by Dr. Frey, in his invaluable *Lepidopteren der Schweiz*. Once up the long zigzag from Sion, and we avoided the sun by an early start at six, the ascent is gradual, the road tolerable, and the surroundings magnificent. It is, in fact, a garden of wild flowers all the way to Evolena: the wild raspberry canes loaded with luscious fruit, the scented alpine strawberry, inviting frequent and delicious rest by the side of the numerous rushing waterfalls that discharge themselves into the thunderous Borgne far below. The first insect on the wing as we turned the last bend of the road was *P. damon*—this must have been about 7.30 a.m. Then followed *Colias edusa*, with *C. hyale*, in the lucerne meadows. *Papilio politaliris* and *P. machaon*, *Parnassius apollo*, and the usual Fritillaries, and crowds of common fry. *Melitaea athalia*, almost over; *M. phoebe*; the interesting *M. didyma*, Staudinger's var. *alpina*; *Argynnis niobe*, with an occasional *Satyrus proserpina*; and now, as we rapidly ascend, *Brenthis pales*—no two alike; *B. amathusia*, with *Erebia tyndarus* shining glossy green in the sunshine. *E. gorgee*, *E. goante*, *Melampias melampus*, *M. ceto*, and, in the marshy waste by the roadside, *M. epiphron* var. *nelamus*, *Cupido minima*, with *Plebeius aegon* flitted merrily over the boulders, and the knapweed was alive with aberrations innumerable of *Syrichtus fritillum*, which yet remain to be identified, and *S. sao*; *Spilothyrus lavaterae* (1). *Pamphila comma*, very active and swift on the wing, was the predominant “skipper.”

Evolena (4,520 ft.) boasts two hotels, of which the Hotel d'Evoline is the best built, but for collecting alpine species Arolla (6,570 ft.) is an infinitely better headquarters, as the latter spot is in the heart of the glacier region. From Evolena, however, I made several pleasant excursions, and on the actual summit of the Sassenaire (10,690 ft.), an easy walk, I was fortunate enough to bag *Erebia glacialis*, while the track to the Col de Torrent yielded *E. oeme*, *E. lappona*, *Melitaea aurinia* var. *merope*, very washed out greasy-looking wings, and diminutive individuals, *M. aurelia* var. *britomartis*, *M. cynthia* and *B. pales* ab. *napaea*. *Colias phicomone* made its appearance in some numbers above 5,000 ft., and on the hags among the cotton grass at the same elevation, but not extending so high, *Coenonympha satyrior* was common. The mule path from Evolena to Arolla, about three hours distant, with a good new hotel (Spahr's) building, passes through pine woods and alpine meadows, but it was clearly getting late in the season when I left, on August 20th, for the latter delightful place. Moreover, the weather again became extremely bad, terminating on the 28th in a heavy downfall of snow, which effectually put an end to my collecting, and sent me to Geneva, where I remained at Petit Lancy until September 3rd. Judging from the condition of most insects on the wing at Arolla, I should say the best time for what must be a splendid locality is fully a fortnight or more earlier. I, however, took a very fair series of *Polyommatus orbitulus* on the Pas de Chèvres (9,355 ft.), about five hundred feet below the top of the pass, varying as much as those described by Mr. Tutt, from the Dauphiné (*Ent. Rev.*, viii., p. 255), one large male approaching to black, the marginal peacock eyes on the hind wings very distinct. Of *Polyommatus eros*, which I have found commonly with *P. donzelii*, at Saas Fee, I only took one specimen on a piece of marshy ground, where I also found fine females of *Chrysophanus hippothoe* var. *eurybia* in some abundance, with occasional males, much worn, which suggests that the latter are earlier emerging. *Pieris callidice* and *Colias palaeno*, also taken on the Gletscher Alp, at Saas Fee, were conspicuous by their absence. *Argynnis niobe* ab. *eris* was common in the sunny openings of the famous woods which have given their name to the Arolla pine, while on the moraine, which runs almost down to the old hotel, where the "edelweiss" grows in great abundance, I took a perfect but undersized *Parnassius delius*, the only one I remember to have seen in Switzerland this year. This was also a favourite haunt of the commoner *Erebiids*, but, on the whole, butterflies were decidedly scarce, and after August 25th I saw nothing worth noting, save a fair specimen of *Pieris napi* var. *bryoniae*, at the Lac Bleu, on the 27th. Under more favourable meteorological conditions I might have seen and done more, and I hope it will not be long before I visit Arolla again, earlier in the season, though at all times, I should imagine it is as well to go provided with plenty of warm clothing, for the nights are very cold, and the mornings as well, until the sun tops the amphitheatre of the mountains in which the two hotels—there is no village—are situated. To the student, the extraordinary variation and the gradual apparent merging of one alpine species into another offer an inexhaustible field for research. The life-histories of many are quite unknown, while the astonishing altitude attained by individuals is a matter of considerable

interest. For instance, our ubiquitous friend *Aglais urticae*—usually a finer brighter-coloured insect in the higher alps than we know it at home away from the Scotch moors—I have found, sharing with *Colias phicomone*, the last patch of herbage on the snow line at 10,000 ft., while other insects associated in the insular mind with low levels and sunny English meadows, have a strange way of turning up at 5-6,000 ft.—*Eugonia polychloros*, for instance, at Evolena; *Melanargia galathea* and *Aporia crataegi*. As for that much abused person, the mere collector, with whom (*pace* our editor) I must class myself, Switzerland is a perfect paradise for him, and the best of it is that both he and his more scientific brethren may elongate their series indefinitely without fear of reproach, since, so far as mountain genera are concerned, the supply is practically limitless. The great difficulty, however, for the peripatetic collector is the setting and storage of his captures. If he is moving about off the beaten track, store-boxes, drying-cases, and the like, are troublesome impedimenta, and for shaking the pins out of cork recommend me to the baggage mule. He must, I take it, therefore, fall back on papers for his specimens, and my experience in this respect is, that insects relegated to envelopes are very nearly always more or less damaged—which, however, may be due to native clumsiness. This year I took my boards along with me, and had good sized store boxes posted from England in ample time—mountain posts are erratic—and as you can post anything in Switzerland for next to nothing to every place which boasts a post-office—that is to say, every place which owns an hotel of some sort, I believe it is better to proceed in this way than to trust to the lesser inconvenience of folding butterflies, to be reset at home, if anything is left of them. But on this point I would ask for “more light,” and no doubt the readers of the *Entomologist's Record* will be able to supply it. A good field kit for the campaign is a desideratum. [We should be glad of suggestions on these points.—ED.]

A critical resumé of the arguments for and against *Tephrosia bistortata* (crepuscularia) and *Tephrosia crepuscularia* (biundularia) being considered distinct species.

By J. W. TUTT, F.E.S.

(Continued from p. 9).

I have a letter before me from a well-known entomologist, in which the two following statements occur: “I do not think *T. crepuscularia* (the early species) occurs in Scotland,” and, a few lines lower down:—“I have no Scotch specimens of these species (*T. crepuscularia* and *T. biundularia*).” Now, this is the sort of logic one is always finding in the quasi-science of amateur entomologists in this country. This gentleman is not alone in his opinion, but for all that, it is an erroneous one.

We read (*Ent.*, xix., p. 161) the following note by Mr. Doubleday:—“Oct. 20th, 1861. The dark *Tephrosia* is far more difficult to procure than the pale one I have never seen it from the North of England, but it is plentiful in Scotland,” and, again, under date of Feb. 5th, 1863, he again observes:—“About Warrington, *biundularia* occurs; but they get a dark smoky variety, totally unlike

the Scotch *crepuscularia*" (*Ibid.*, p. 162). Mr. Smallwood (*Ibid.*, p. 268) writes :—"Specimens from Perth are larger and better marked than any of the preceding, the ferruginous band becoming umber-brown." He also refers (*Ibid.*, p. 269) to the "remarkable fineness of Scotch specimens." In *Entom.*, xx., p. 182, I wrote :—"Ova of *T. crepuscularia*, laid during the last week in April, from Perth, hatched May 20th. One or two went down June 15th; the others are, with only two exceptions, pretty well full-fed. I am anxiously looking forward to rearing July specimens of this brood, as a second brood never occurs in a state of nature near Perth. My *T. crepuscularia*, even from the north, as well as those from the south-west (Clevedon, Somerset), were nearly full-fed larvæ when the imagines of *T. biundularia* first began to appear in the south (Kent), and, whilst *T. biundularia* are still flying, *T. crepuscularia* (north and south, *i.e.*, from Somerset and Perth) are pupating." I may add here that a few specimens of the Perth *crepuscularia* did emerge as a second brood, and were of the dull white-grey or leaden hue of the southern second-brood form. Since then I have bred the Perth insect on three occasions, always with the same result. I wish to insist on this, as the form has, I believe, never been really studied, in all its stages, by any other entomologist. I do not wish to suggest, nor you to infer, that I do not think that *T. biundularia* may occur in Scotland; in fact, I am astounded that it has not been recorded from the district south of the Forth and Clyde, and have no doubt that it will be so recorded at no distant date. [Mr. Adkin has shown me a worn specimen of a *Tephrosia* from Moray, which he thought at first might be *T. biundularia*, but careful examination has resulted in Mr. Adkin, Mr. South and myself, concluding, so far as its condition will allow us, that it is *T. crepuscularia*, but as Mr. Adkin has pupæ from this specimen, we shall probably be able to form a more correct judgment in a short time].

Reference to the *Entom. Record*, vol. viii., p. 81, will show that the Continental form of *T. crepuscularia* is the *bistortata* of Goetze, that our ochreous spring brood is quite unlike it, and is the *abietaria* of Haworth, whilst our small, pale, whitish-grey second brood is the *consonaria* of Stephens. I would now refer you to my collection. You will see there that the German and Perthshire series of this species are almost identical, *i.e.*, they are typical *bistortata*, Goetze. The early-brooded specimens (= *abietaria*, Haw.) and the late-brooded specimens (= *consonaria*, Stephs.) are unmistakable.

I may refer to a few other points. Mr. Tugwell (*Proc. Sth. Lond. Ent. Soc.*, 1889, p. 142) exhibited specimens, and concluded :—"Although these two insects have a very strong general resemblance, he was convinced, after repeatedly breeding both insects, that they were two distinct species." Again (*Ibid.*, 1890, p. 24) we read :—"Mr. W. H. Tugwell exhibited a series of *Tephrosia crepuscularia* and *T. biundularia*, with water-colour drawings of the larvæ of both from life, and remarked that, after repeatedly breeding both insects, he was convinced as to their being distinct species, although evidently closely allied In every case the insects remain true to the parent type, and, although the markings are somewhat alike in both, yet there were characteristic differences, as shown in the series exhibited, and this applied to the larval stage also, and was more

easily followed by the drawing than by any verbal description." Mr. C. Fenn remarked that he had "repeatedly bred both species, and had always found that the two species bred true; he had also observed differences between the two larvæ" (*Ibid.*, p. 25).

I have elsewhere in this paper (*ante*, vol. viii., p. 285) stated that I disagree with the diagnoses of these species made by the Rev. G. A. Smallwood (*Entom.*, xix., p. 162). He states, among other things, that "*crepuscularia* is smaller, and has the second line followed by a more decided band of brown." Now, there is no doubt that *biundularia* is distinctly the smaller species, and that when *crepuscularia* is smaller than *biundularia*, as is the second brood, the specimens are of a dead white (with a tinge of leaden hue) and have rarely any trace of a brown band, and one can only assume, from his remarks (*Ibid.*, p. 181), where he states that he had specimens of the "pure cold grey" second brood of *T. crepuscularia*, that he was, as he practically owned, irretrievably mixed. His remarks on Newman's and South's broad terms of distribution are probably just, so far as regards the possibility of the published records, both here and abroad, being unsatisfactory, owing to the inability of many entomologists to distinguish *biundularia* and *crepuscularia*, but we demur altogether to his conclusion, and to the strange use he makes of a quotation from Doubleday's *List* (1873), where Doubleday's explanatory notes he considers point to "the overwhelming authority of Esper, Haworth and Guenée, for saying that *T. crepuscularia* and *T. biundularia* are varieties only of one species, while Doubleday stands alone as the advocate of a second species." Certainly Esper figured both species under the same name, but so he did dozens of other species, whilst Haworth was so inextricably mixed that the two species occur, in some form or other, under at least three names. Stephens and Wood not only advocated two, but actually made four, species out of them, and one can only regret that Mr. Smallwood so readily fell into the same pitfall as do most English lepidopterists who tell us what the old authors do, *viz.*, take for granted some one else's statement as to what they say, instead of finding out for himself what they really do say.

I would not trouble you to compare carefully the drawer of *T. biundularia* with the two drawers of *T. crepuscularia*, but Mr. Barrett (*Proc. Sth. Lond. Ent. Soc.*, 1890, p. 25) says:—"Similar forms (to the German specimens) have been found in the middle and north of England." Probably Mr. Barrett has some, but for all that I ask you whether there are any north English specimens like the German specimens?* Mr. Barrett further says that "the shape of the wings in the two forms is absolutely identical." I again ask whether you do not all discern a marked difference in the shape of the squarer-winged *biundularia*, in which the breadth is greater, compared with the length. He further states that the difference between the two species is "merely one of colour." I ask you again to say, after careful comparison, whether that is so; and lastly, I would ask you to compare carefully the small specimens of the second brood of *crepuscularia* with *biundularia*, and say whether "the second brood of

* Mr. Barrett exhibited his German specimens, which were a mixture of *T. crepuscularia* and the dark ab. of *biundularia*. The latter are, therefore, very similar to those forms which are so common in the middle and north of England.
—J.W.T.

the brown *crepuscularia* is obviously *biundularia*." You have before you to-night probably the most extensive series of these species ever made in Britain. I ask you whether their characters are not patent.

I have, for the sake of expediency, referred continuously in this paper to the first brood of *T. crepuscularia* as the ochreous form, to the second brood of *T. crepuscularia* as the dull white-grey form, and to *T. biundularia* as the paler species, and in a general way these definitions are true, and we could add to these the typical form of *crepuscularia* (= *bistortata*, Goetze) as represented by the German and Perth insects as the fuscous or umber-brown form. But these are all comparative terms at the best. There are white, ochreous, fuscous, and black (-brown) *crepuscularia*. There are white, ochreous, and black *T. biundularia*. The whitest *crepuscularia* are absolutely whiter than the whitest *biundularia*, and it is possible to find some *biundularia* more ochreous than some *crepuscularia*, but parallelism of colour variation is not sufficient to unite, as one species, insects with distinct and separate life-cycles, and there is no more logic in uniting *Agrotis cursoria* and *A. tritici* as one species, because I disagree with Mr. Barrett as to the exact locus of a particular aberration of what we know must be one of these species, or, in uniting *Cidaria immanata* and *C. russata*, because a certain aberration would be differently placed by Mr. Fenn and myself, than in uniting *T. crepuscularia* and *T. biundularia*, because Mr. Barrett fails to place an aberration from Derbyshire, or German specimens which represent a race (of one of the two species) with which he was entirely unfamiliar. For this reason, I leave out of account entirely the parallel dark aberrations of the two species which require training to locate, but, given time and practice, I have no doubt many lepidopterists will locate these as certainly as can Mr. Prout, Major Robertson and other keen and practical entomologists.

In taking leave of the aberrations of these species in this summary way, I would insist that, apart from the melanic aberrations that both species present, *T. crepuscularia* is (as asserted by Doubleday, Chappell, and others, and negatived by Mr. Smallwood) distinctly the darker species.

The rest of my note must necessarily be brief. Although I have throughout considered and spoken of *T. crepuscularia* as the early species, and given its dates of appearance as March and April, yet much necessarily depends upon the season. In 1893, it was recorded the last week in February, and in 1888, by Mr. C. G. Griffiths, on May 5th. In 1893, *T. biundularia* was out by the second week in April, in 1888 it was not out until late June, and occurred even into July. To compare the April emergence of *T. biundularia* in 1893 with the May emergence of *T. crepuscularia* in 1888, is obviously useless and absurd, but that is what is repeatedly done, the date of appearance of *biundularia* in one year, compared with the date of appearance of *T. crepuscularia* in another, and *vice versa* (see *Entom.*, xix., p. 270, and *E.M.M.*, xxiii., pp. 41-42). The second brood of *T. crepuscularia* was out, in 1896, before the date at which *biundularia* occurred in 1888, but this does not vitiate the broad principle nor weaken the general argument. Each year must be taken by itself, and the relative time of appearance will usually show a clear four or five weeks between the first emergence of *T. crepuscu-*

laria and that of *T. bimaculata*, and another three or four weeks between the latter and the second brood of *T. crepuscularia* in any given year. There is also the particular and not uncommon phase to be considered when a continuation of low temperature may prolong the emergence of either species over a considerable period of the same year.

Connected with this question of date is another matter, *viz.*, the occurrence of partial third broods of *T. crepuscularia*. Some fifteen years ago, Mr. Ovenden and myself bred several of the stunted little creatures, which are the usual result of this brood. These are of the ordinary type of the second brood of this species. Mr. E. W. H. Blagg records an individual of this brood (*Entom.*, xix., p. 303); Dr. Riding records another (*Ent. Rec.*, viii., p. 189). I dare say it is not uncommon in confinement, although the records are few. Probably, too, it occurs occasionally in a state of nature.

(To be concluded).

Notes on Coleoptera.

BETTERIES THAT DESTROY FORESTS (THE SCOLYTIDÆ).

By CLAUDE MORLEY, F.E.S.

While travelling through Suffolk by rail the other day, and noting the exquisite autumnal tints of that beautifully wooded county, and here and there its darker patches of fir coppice, the latter insensibly carried my thoughts further north, to where one finds mile upon mile of this darker foliage, not, however, in patches, but in great continuous woods, in which one might wander about for a week without coming across any sign of civilisation—woods in which the ordinary tourist would see nothing but hosts of brown trunks and green needles, but which would, to the entomologist, be eloquent with soundless voices, every trunk and every spine have its own particular tenant, and the very ground upon which he trod be securely hiding, from molestation and the inclemencies of the weather, its own particular fauna. A few facts about this insect fauna of the forest may, perhaps, be of interest, especially since it appears to be known only to the few that vast and valuable tracts of timbered land are annually laid waste, and thousands of pounds lost, by the ravages of beetles, which, to the uninitiated, would appear among the most insignificant of created beings, ranging as they do in England from three-quarters to three and three-quarters of a line in length.

We will take, as probably the best known example of the "Borers" in England, *Hylurgus piniperda*, a little, black, rugose, almost cylindrical fellow of two lines long, and his life-history may be taken as a fair example of that of the *Scolytidæ*, though some are double-brooded, which, of course, necessitates greater rapidity of metamorphoses, and a shorter span of life for the perfect insect than is enjoyed by *H. piniperda*. The pines are almost invariably felled in or about March, that being the time when the wood is at its best, and consequently, if the weather be open, the beetles will begin to emerge from their winter quarters and "swarm" about the prostrate trunks, upon which they alight and immediately commence to bore their little circular holes, much in the same way as do the larvae of *Cossus*, or those of the *Sesidiæ*, always first getting in as far as possible beneath the bark, so that in old trees, upon which the bark has become gnarled

and rugged, the holes are hardly perceptible until they have been pushed some distance by the industrious little worker, who throws out periodically small mounds of the gnawed wood, which look like tiny heaps of saw-dust accidentally dropped at irregular intervals upon the trunk. If the bark and liber be stripped off, these burrows will be found to run horizontally through the bark to the cambium-layer, but when the insect feels the greater resistance of wood beneath, it turns off and eats its way through the cambium-layer, always in a longitudinal direction, for a distance of several inches. Copulation is performed, I believe, invariably, in a remarkable situation: the ♂ insect being in the outer air, and the ♀ within the entrance of her burrow. I have very often found both sexes at the end of the burrow, but do not think they copulate there. The eggs are rarely laid before the middle of May, and sometimes not till the first half of July, but this depends greatly upon the severity or otherwise of the spring.

Under favourable circumstances, there are often as many as a hundred and twenty larvæ in one family, and this fact becomes serious to anyone who has noticed the great numbers of these insects that may be seen flying in the early spring sunshine around a dozen pines, felled to form a clearing. I have never personally found this particular insect in a standing tree, but that it does occur there, is beyond doubt. So abundant are they sometimes that Ratzeburg noticed* a hundred parent borings (which are generally upon one side only of the *living* tree) in a space two feet long, and, upon another occasion, fifty-six larvæ within five inches. Each larva bores for about three inches before turning to a pupa. Now, if one takes fifty-six larvæ in a space of five inches, and each bores some three inches during its life, it is obvious the poor host has a very scanty chance of escaping destruction, since it is the cambium-layer, destroyed by the insects, through which the sap circulates, and which, becoming hard, adds to the bulk of the tree, consequently without this layer the tree dies. Having completed their ecyses, the little pests emerge about July or August, but their depredations are not yet at an end: they next fly to the fresh shoots at the end of each twig, bore a small aperture, about four inches from the apex, and, making their way up the centre, gorge themselves upon the luscious sap, and so kill the shoot, which is blown to the ground, breaking at the entrance-hole of the insect, by the first gale of wind. In fir woods the earth is often carpeted with these fallen shoots, in each of which, about the beginning of September, may be found the cause of the injury. Later the borer escapes through a hole at the end of its burrow, and hundreds may sometimes be found hibernating at the base of trunks in the neighbourhood, comfortably ensconced just beneath the soil or moss, half concealed in the bark, and in mild weather they will gnaw promiscuously in their immediate vicinity. This particular species never occurs in fir woods at any great altitude, and almost invariably on *Pinus sylvestris*, though once or twice in Pomerania it has been taken from *Abies excelsa*, though it probably occurred there accidentally.

Hylastes ater is a somewhat similar species, not only in appearance, but in habits and choice of environment, though I have never noticed it attack the same tree. The larva, pupa, and imago have occurred to me in one stump, as early as March 11th, and I was much interested at

* J. T. C. Ratzeburg, in *Die Forst-Insecten*, p. 211.

the time in their curious economy. Another species of the same genus, *H. palliatus*, is by no means a dainty feeder, attacking beech in addition to all kinds of *Coniferae*, and is noted for hitting upon the pines immediately they are felled, and entering at the sawn end at the point of junction of the bark and wood. *Hylastinus obscurus* is anything but a common insect, and I have only taken it in January, in an old stool, where it was probably hibernating. *Phloeophorus rhododactylus* is said to occur in the spruce, which, however, can hardly be the case in England, where this tree is not found in the wild state; the beetles may sometimes be swept from herbage on the outskirts of woods. Occasionally one finds *Hylesinus crenatus*—I once took a great many, making use, together with *Eriirhinus vorax* and *Hypophloeus bicolor*, of deserted *Cossus* borings—in a fine oak, which seemed as yet quite unconscious of the presence of so deadly an enemy, but more often it may be taken from weak ash trees, which it never fails, having once established a colony, to reduce to tinder. *H. fraxini* is far more often taken on the wing, and upon the water of horse troughs, than in timber, and I once found a specimen sitting contentedly upon a *Sagittaria*-leaf, floating at the margin of a river. Of *Scolytus destructor* little need be said, it being familiar to every coleopterist, except to mention the unusual number of dead specimens that are invariably found in its burrows, which make it appear that the ♀, after depositing her eggs, dies, and so provides an additional protection, by blocking the hole with her body, to the young larvæ; in fact, I am by no means sure that the whole genus does not do this, since I have taken *S. intricatus* in Epping Forest, and *S. multistriatus* at Barham, under similar circumstances. A borer that appears to make no regular burrow is *Cryphalus abietis*, which simply eats the bark from beneath in irregular patches at the base of the branches. The most omnivorous species in England is, probably, *Xyleborus savaseni*, which attacks spruce, pine, beech, birch, and poplar with equal avidity, and is, also, though more rarely, found upon oak, maple and lime. Another little species, by no means rare in firwoods, but which appears to do no more than eat the dead and fallen twigs in all its stages, is *Pityophthorus micrographus*, and numbers may be bred by collecting these twigs in the autumn and laying them by till the following spring, when the tiny brown beetles, never more than a twelfth of an inch long, will emerge. The species which is the greatest pest on the Continent is *Tomicus typographus*. It occurs, however, on spruce only, and is consequently fortunately rare in Britain. Their main bore is vertical, and the beetles are very careful where to commence it, and will walk round the stem for some time before arriving at a satisfactory determination, and during which process they are often snapped up by *Clerus formicarius*, *Carabidae* and *Libellulidae*. So abundant was this species in 1783, in North Germany, that 2,000,000 standing trees were killed by them in the Hartz Mountains alone.

There is little doubt that these insects were originally beneficial in ridding the ground of useless encumbrances, such as fallen twigs, branches, and trunks, and still carry on the good work in the tropical forests of South America, and elsewhere, but civilisation has dubbed them injurious, since, requiring the fallen timber for its own uses, it forces the beetles, which can no longer subsist upon dead trees, to

attack, as the best substitute, the living ones, but it will be invariably noticed that the weaker the tree, the more liable it becomes to the attacks of the *Scolytidae*.

On the seasonal dimorphism of *Melanitis leda*.

By C. A. BIRD.

Looking through my Indian notes, I find some interesting particulars relating to the two forms of the species of butterfly which, I believe, until 1889, or thereabouts, went under the two names of *Melanitis leda* and *M. ismene*.

On October 15th, 1889, I obtained a female of the form known as *M. leda*. By next day I had obtained 30 eggs. These hatched out in five or six days. The young larvæ fed up well on grass. Two were accidentally injured, a few escaped and a few died. The survivors began to suspend themselves on the 11th November, and between the 12th and 16th November, 18 pupated. From these I obtained 16 imagines. They began to emerge on the 20th or 21st of November, when I was unfortunately absent from home on duty, so that I found five out when I returned on the latter date. One of these five was of the form *leda*, the rest, to my surprise, were of the form *ismene*. All the remainder were of the form *ismene*. I feel sure of this, although two of them escaped so suddenly that I only had a glance at them as they flew away. I thought I had made a discovery, but I afterwards read a notice in a number of *The Asian** of the same year, but of an earlier date, showing that the fact of these being of one and the same species was already known.

I suppose this is an example of seasonal dimorphism, but the following facts must be remembered. One specimen out of the 16 was of the same form as its female parent, and, in nature, the two forms overlap in the matter of periods of appearance. I took the form *leda* in the months of August, September, October and November, and the form *ismene* in October, November and December of the same year; so that both forms were on the wing in the months of October and November. I find, from my diary, that the first specimen of *ismene* was taken in the third week of October, that is within a week after the date on which the batch of eggs referred to above were laid. [We have ourselves touched on this subject in our last Presidential address to the City of London Entomological Society. There are some very interesting facts relating to "wet" and "dry" seasonal forms in *The Journal of the Asiatic Society of Bengal*, vol. lviii., by Doherty, and in the *Butterflies of Sumatra*, by Nicéville.—Ed.]

* A magazine published in India (Calcutta, I believe), on the lines of *The Field*.

SCIENTIFIC NOTES AND OBSERVATIONS.

THE COCOONS OF *ACHERONTIA ATROPOS*.—My nephew and I carefully exhumed the pupæ of *A. atropos* last autumn, and we tried to extract the "cell" complete. In this we failed entirely. There was not the slightest cohesion, and in only a few cases did we manage to secure small pieces of the side to examine. This, of course, in sandy soil. I presume that in heavier earth there would be a better chance; but I am certain there is no trace of silk, and very little of gum. The

chief thing I could discover was the impression of the face, or one side thereof, upon the inner surface, which was fairly smooth, save for these impressions.--(Rev.) C. R. N. Burrows, The Vicarage, Rainham, Essex.

A NEW BRITISH SPECIES OF THE GELECHIDÆ: *LITA INTERMEDIELLA*, HODGKINSON.—In the October number of *The Entom. Record*, I noted a probably new species of *Gelechia*. It is quite distinct from *Lita fraternella* and *Lita viscariella*, the yellow spots being smaller, and the insect itself more mealy in general appearance. It agrees with a specimen that I have had for some years, and which has stood reversed in my cabinet as undetermined, thinking it might possibly be a worn specimen of *fraternella*. I have all the species of this group, except *cuneatella* and *vicinella*, and it is referable to none of the species in my collection.—J. B. HODGKINSON, F.E.S., Rosebery House, Ashton-on-Ribble. [There are between 80 and 90 European species of *Lita* described. Surely our correspondent should compare his species with the descriptions of all the described European species before providing it with a name. Several Micro-lepidopterists have since referred the specimen to *L. fraternella*.—ED.]

HOW *COLIAS EDUSA* WINTERS.—In the *Ent. Record*, vol. vii., pp. 250–252, I discussed the question of “How *Colias edusa* winters,” and I have summarised the results there arrived at in my recent book on *British Butterflies*, pp. 261–262. Regarding the spring emergences of this species, *viz.*, that in February and March, and the later one of May and June, Mr. Merrifield has put into my hands information in support of the paragraph relating to the first of these (*Ent. Rec.*, vii., p. 251). The writer is an inhabitant of Hyères, and he offered to get Mr. Merrifield “larvæ and eggs in March or April.” Mr. Warburg, too, has sent me the dates on which he captured these broods at Cannes. From these I find that he captured the early brood from February 17th onwards, in 1892, and the second from May 9th onwards. In 1894 the dates extend from February 17th onwards for the first, and May 10th onwards for the second, whilst captures in April suggest either that the first brood hangs about for a considerable time, or that the second one feeds up rapidly, and appears quickly. Probably it is the latter, for migrants reaching England June 1st–8th, in 1877 and 1893, produced imaginal progeny July 24th = 6–7 weeks, so that perhaps the dates of April 11th for 1892, April 4th, 1893, April 10th, 1894, represent the earliest emergences of the second brood. Mr. Warburg says:—“*C. edusa* is not an insect that one goes out of one’s way to catch on the Riviera, so that the fact of my not taking it before a certain date does not show that it may not have been out some time.”—J. W. TUTT, Westcombe Hill, S.E.

ON THE AFFINITIES OF *EPINEPHELE TITHONUS*.—With regard to your remarks (*ante*, vol. viii., p. 236) anent the classification of *Epinephele tithonus*, do not you think that the masculine sexual shading of this species indicates that the group it belongs to is that which is so characterised? I refer, of course, to the patch of heavy scaling on the fore-wings of the males of most species of *Epinephele*, absent in all the *Coenonymphi* that I know. The species nearest to *E. tithonus* is *E. ila*. The females of both species approximate nearly, but the ♂ patch is different in contour. As to the early stages of the insects (*E. tithonus* and *Coenonympha*), I am quite ignorant.—W. F. DE V. KANE, M.A., F.E.S., Drumcrae House, Monaghan.

NOTES ON THE TIME OF APPEARANCE OF SOME BUTTERFLIES AT HYÈRES. — Recently I spent a couple of days with Mr. Merrifield, and among other things discussed was the time of appearance of many species of butterflies in Southern Europe. From his correspondence with a gentleman of Hyères he gave me the following information :— “ *Glonopteryx cleopatra* flies at Hyères in March, and lays its eggs at the end of March and in April.” By April 25th (1896), 120 eggs had been obtained, and in sending them to Mr. Merrifield the collector writes :— “ Some of them will no doubt have become larvæ by the time they reach you. It is not so easy to get the ♀ *cleopatra* to lay as some other butterflies. The eggs sent were laid by a number of different females, and some of the eggs I found myself out of doors. The second brood of this butterfly differs considerably from the first, especially the males, which are much brighter on the underside.” “ *Pararge egeria* is on the wing in the middle of February, and the specimens of the brood are probably a little more like the English form than those of the later ones. *Colias edusa* appears here in March; larvæ may be found now (Nov. 1st, 1895), and in the spring. *Pieris daphidice*.—The early spring form, *bellidice*, is already (Feb. 17th) flying; the butterflies from the eggs of these should emerge in May, but they will very often, I have found, remain much longer in the pupal state, even till the next spring. *Anthocharis belia* occurs in April. I have had pupæ from the spring brood of *A. belia* for two years, after which they emerged in April as the type form. *Charaxes jasius* pupates in February, from the middle to the end of the month. *Aporia crataegi*.—The imago of this species is now flying (April 25th, 1896).”—

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

NOTES ON THE EARLY STAGES OF EPINEPHELE IANIRA.—Ova received from Mr. J. W. Tutt, July 15th, 1896. *Egg*.—With longer axis vertical, oviform, except that the upper (smaller) end is flat, as though it had been cut clean off. Roughly ribbed, the flat top has a slight lip or ridge round its outer margin; a slightly raised surface in centre of flat top has a honey-comb appearance. The larva eats an irregularly shaped slit just below the top, and forces its way out. *Newly-hatched larva*.—July 17th, 1896, 1st skin.—*Head*.—Rather large, rounded, green in colour, bearing long, stiff, thorny black hairs. *Body*.—Tapers towards anus, and slightly towards head. Scutellum, indistinct. Has a dark clear green medio-dorsal stripe, and also faint irregular dark stripes on the sub-dorsal and lateral areas. Segments, distinct. Tubercles, tall and soft-looking, bearing one hair only; trapezoidals placed almost as if at the points of a square. Hairs, white, long and thorny; some bend forwards, others backwards. Posterior trapezoidals smaller than anterior, and bearing smaller hairs (one hair arising from the right anterior trapezoidal on 3rd abdominal segment is black, with the exception of a white tip*). The spiracles are mounted on short black stalks. It is a very sluggish larva, and rolls in a ring if disturbed.

August 9th, 1896, 2nd skin.—Colour, bright green, with a faint darker medio-dorsal line. In all other respects, as to structure, shape,

* Possibly an aberration exhibited by this particular larva only.—A.B.

etc., it agrees with *Enodia hyperanthus* in 2nd or 3rd skin. It still rolls in a ring if disturbed, and in this respect differs from *E. hyperanthus*.

September 22nd, 1896, 3rd skin.—Length, $\frac{3}{16}$ of an inch. Rests with the fore part of the body raised, the head turned downwards. *Head*.—Bright green, rounded, very rough and pitted, larger than pro-thorax, numerous long thorny hairs. *Body*.—Tapers from meta-thorax forward to head, and backwards to anus. Divisions of segments distinct; the thoracic segments have 4 sub-segments. On the abdominal segments the sub-segments are not marked clearly enough to count. A whitish lateral flange now present. The two processes projecting beyond anus are longer than in *E. hyperanthus*. Hairs long, stiff, thorny and curved backwards; bases, black. Numerous smaller secondary hairs present, but no trace of spicules. Spiracles still mounted on short stalks, but they are dull yellowish instead of black, and do not show up so clearly as in earlier stages. The larva still rolls in a ring if disturbed.—A. BACOT, Bow House, St. James' Terrace, Clapton, N.E.

EGG OF A LARGE GNOPHID MOTH, GNOPHOS FURVATA.—Barrel shaped, but yet Geometer-like, laid on its long side, and fastened to object on which it is laid. About 12 well-developed ribs running longitudinally from micropyle to opposite end. Length to breadth to height : : 4 : 3 : 3. The depressions between the ribs marked transversely, with ladder-like ridges dividing the area up into roughly hexagonal cells, which become very regularly hexagonal on the narrow end opposite the micropyle. The micropyle itself consists of a tiny rosette of very minute cells, surrounded by larger regular hexagonal cells. The egg bears the most extraordinary similarity in general facies to a Satyrid egg laid on its side. At first the colour is pale yellowish, then reddish, then darker. The empty shell is perfectly transparent, and the young larva emerges by eating out a very regular hole at the micropylar end. The moth was taken at Grésy-sur-Aix on July 26th; the eggs hatched in between three and four weeks. I did not keep the exact date.—J. W. TUTT.

FEEDING LARVÆ OF ARCTIA CAIA ON LETTUCE.—I can endorse what was said at the August 18th meeting of the City of London Entomological Society, about the results of feeding *A. caia* on lettuce. I have had them go on from ova to pupæ in the space of two months when so fed. I once had them turn to imagines in November (not by forcing, but under very nearly natural conditions, in a breeding cage kept in the open air). In this case they were *not* fed on lettuce, but on dock and other green stuff.—ALBERT H. WATERS, B.A., Cambridge.

VARIATION.

ABERRATIONS OF *POLYGONIA C-ALBUM*.—The aberrations of *Polygonia c-album* were divided by Petiver into the following:—"The silver comma (*fusca*)," "The pale comma (*pallidior*)," "The jagged-winged comma (*laceratis*)" and "The small comma (*minor*)." The "pale comma" is described as "below, of an oker marble, and paler than the last." This is, of course, Robson's ab. *hutchinsoni* (not *hutchinsonii*), Bath's *lutescens*, and the *pallidior*, Pet., of Tutt's "British Butterflies." The ab. *pallida*, Tutt, is an upperside, not an underside aberration, so

that Mr. Shipp is altogether wrong in his conclusions (*Entom.*, xxx., p. 16).—J. W. TUTT, Westcombe Hill, S.E.

LOCAL FORM OF *AGROTIS OBELISCA* AT BOURNEMOUTH.—I captured some very fine specimens of *Agrotis obelisca* here in August last. They began to appear just as *A. nigricans* was getting worn and over. They do not agree altogether with the Freshwater (Isle of Wight) specimens of *A. obelisca*, being much browner in hue, and Mr. Tutt informs me that they are much nearer the Scotch form of the species.—P. M. BRIGHT, F.E.S., Roccabruna, Bournemouth.

DARK ABERRATIONS OF *LIMENITIS SIBYLLA*.—During the first week of July last year (1896) I captured five specimens of the dark form of this insect in the New Forest. Four of them were taken on successive days, within a dozen yards of the same spot, close to a small stream, and Mr. C. Gulliver took one at the same place. They are all females, and range from almost wholly black (one spot on the apex of front wings) to a row of faintly-marked spots. All are slightly worn.—STUART G. HILLS, Public Library, Folkestone.

QUERY AS TO *MIANA BICOLORIA* AND ITS FORM *RUFUNCULA*.—Out of some fifty specimens of *Miana bicoloria* and its ab. *rufuncula*, taken together last season, I noticed that invariably in this case the insects died in the cyanide bottle in a different way. *M. bicoloria* always died with its wings upright over the back, whilst *rufuncula* always died with its wings in their usual resting position, covering the body. As this was invariably the case last season, it can hardly have been a coincidence, but rather points, to my mind, to some structural difference in the two. Can it be that Haworth was right in treating this variety as a distinct species?—W. B. THORNHILL, Castle Cosey, Castle Bellingham, Ireland.

NOTES ON COLLECTING, Etc.

REARING *POLIA XANTHOMISTA* VAR. *NIGROCINCTA*.—In answer to Mr. H. Tunaley's remarks (*ante*, vol. viii., p. 310), I would like to suggest that he should at least have made known to the advertiser of the ova of *Polia* var. *nigrocincta*, that the majority of the eggs he had received had not hatched, and to have returned the infertile ones, which I would then have replaced with others. As he has not done this, he can hardly blame the sender. Perhaps it would be better if he collected the ova himself, as he might be more particular in selecting them. At present I cannot say whether the infertility of the eggs was my fault, his fault, or the fault of the moths. I do know, however, that the eggs changed colour before I sent them out.—H. MURRAY, Lowbank Villas, Carnforth.

My attempts to breed this species from the egg, in 1895, and again last season, have met with no better success than those of Messrs. Christy and Tunaley (*Ent. Rec.*, viii., pp. 241, 310). Mr. Murray sent me, on each occasion, about 30 ova, which hatched well enough, but although the larvæ thrive capitally for a time, they afterwards gradually died off, and not one of them survived to go down. The first batch were fed on sallow and lettuce, the other on flowers of sea-pink. A few of my friends, who have had great experience in larvæ breeding, also received ova, but their efforts were rewarded with no better luck, and I have not heard of a single imago having resulted

from the eggs recently sent out by Mr. Murray, which seems strange, considering that in a letter written to me last year, he says, "I think it is quite a mistake to say *P. nigrocincta* is hard to rear, as I think it is very easy; at least, I do not find it hard." He does not, however, mention the percentage of moths that he usually succeeds in rearing from the egg, which it would be interesting to know. If any of his correspondents have been more fortunate than ourselves, I hope they will kindly give us a few wrinkles as to treatment, etc.—EUSTACE R. BANKES, M.A., F.E.S., The Rectory, Corfe Castle. Dec. 15th, 1896.

PLUSIA FESTUCE DOUBLE-BROODED.—*Plusia festucae* is so scarce about here, that we have not many opportunities of recording its capture, but the solitary specimen I have taken flew into a lighted room on the 3rd of September last. It was a perfect specimen, and apparently quite freshly emerged.—W. W. ESAM, Eagle House, St. Leonard's.

THE PARTIAL DOUBLE-BROODEDNESS OF *PLUSIA FESTUCE*.—AS regards the partial double-broodedness of *Plusia festucae*, I have never come across it except in the North of Ireland. On reference to my notes, I find that, in 1894, June 26th was the earliest date of capture. Ova were deposited on the 28th, hatched on July 4th. One larva only fed up quickly, producing an imago in August, the remainder hybernated, half the larvæ being sleeved on growing *Iris* in an outhouse, the other half sleeved on *Iris* in the open woods. On June 4th, 1895, I took both larvæ and cocoons at large, and mine, in both sleeves, had partly pupated. On June 14th, the first imago appeared, and they continued to emerge from the three batches throughout that month. I see also that, on June 27th, I took the insect in good condition at large. Ova were again obtained, with a precisely similar result, except that two fed up and emerged, as against one the previous year. The insects and larvæ were obtained in swampy ground round the margin of a large pond, and both light and dark forms occurred, the latter preponderating largely.—(Colonel) CHAS. E. PARTRIDGE, 20, Hornsey Rise (Gardens).

BRITISH AND FOREIGN SPECIMENS.—Some years ago a boy brought me some insects to name, mostly of species common in England, but, to my surprise, *Uncamidophorus rhododactylus* and *Herminia derivialis* were also there, as well as a *Nyssia*—probably *pomonaria*. I asked him where he had got them, and he replied "About the school." A further enquiry elicited the fact that he had been to school at Heidelberg. He offered me any specimens I might like, but I took none. I have no doubt, however, that the specimens are doing duty somewhere, probably as British, and it shows how easily foreign specimens may be introduced into British collections.—J. B. HODGKINSON, F.E.S.

CAPTURES AT READING IN 1896.—I took a number of good things last season: *Endromis versicolor*, *Stauropus fagi* (including 12 of the black aberration), *Noctua rhomboidea*, *Calymnia pyralina*, *Tiliacea (Xanthia) aurago*, *Dasycampa rubiginea*, all plentifully, whilst of *Dicycla* oo I secured about one hundred specimens, about a half of which were the ab. *renago*.—W. BARNES, 7, New Road, Southern Hill, Reading.

POLYOMMATUS IOLAS IN SWITZERLAND.—A QUERY.—I should be glad to know whether any of your readers have ever taken *Polyommatus iolas* in Switzerland. Kane speaks of three taken near Sierre (in the Rhone Valley), and, curiously enough, I have three specimens which I captured at Sierre (one about five years ago, and two the following

year), but I have never seen it elsewhere in Switzerland. I also once found the larvæ at Sierre, so that I suppose it occurs there annually in small numbers. The food-plant, *Colutea arborescens*, is pretty abundant in that locality.—R. D. POSTANS, East Grinstead.

CHOEROCAMPA NERII IN 1890.—Your note on *Choerocampa nerii* (*ante*, vol. viii., pp. 273-4) awakens recollections. The specimen was taken in 1890 (not 1892). Mr. R. C. L. Perkins, now, I think, in the Sandwich Islands, was then living at Dartmouth. He saw the specimen as soon as captured, and wrote to me about it. At my suggestion, Master H. F. Owen, of Stoke Fleming (not Stoke Henning), sent me the record of its capture, which duly appeared in the *F.M.M.*, vol. xxvi., p. 328.—CHAS. G. BARRETT, F.E.S., 39, Linden Grove, Nunhead.

ABRAXAS GROSSULARIATA EMERGING IN NOVEMBER.—Some two or three hundred larvæ of *A. grossulariata*, beaten last autumn (1896), from spindle, were brought indoors and sleeved on a branch in water. The larvæ began to hibernates at the end of October (although the room always has a fire in it), with the exception of one individual, which fed on and pupated, producing a quite normally-marked imago on Nov. 17th, 1896. The remainder are still larvæ of, perhaps, one-third of an inch in length.—J. C. WARBURG, 8, Porchester Terrace, Hyde Park, W.

THE GEOGRAPHICAL DISTRIBUTION OF *THAMNOTRIZON CINEREUS*.—At a recent meeting of one of the entomological societies in London, some specimens of this Orthopteron were exhibited as having been obtained in the New Forest, with the information that they are "rare." Permit me to say that, according to my experience, this species is the commonest and most widely-distributed of the family *Locustidae* in this country. I have found it in most of the southern counties where I have collected, and, though local, it is usually abundant wherever it occurs, including the New Forest. I know many localities also for it in the Midlands.—W. HARCOURT BATH, Birmingham.

SALE OF MR. C. A. BRIGGS' COLLECTION.—A few of the prices paid, on Nov. 10th last, for some of the PYRALIDES sold in Mr. Briggs' collection are, perhaps, worth mentioning. The chief were:—*Scoparia atomalis* (2 abs.), £2 5s.; *S. atomalis* (3 abs.), £2 5s.; *S. ulmella* (banded ab.), 22/-; *S. alpina* (banded ab.), 25/-; *Oxyptilus parvilactylus* (ochreous ab.), 12/-; *Crambus alpinellus*, 10/- (6), 12/- (6), 12/- (5), 10/- (4), 21/- (3); *C. verellus*, 16/-, 26/-, 45/- each; *C. myellus* (3), 15/-, 18/-; *C. rorellus*, 30/-; *Ephestia pryerella*, 40/-. A further portion of Mr. Briggs' collection, sold on Nov. 24th, produced, among others, the following prices:—*Setina irrorella* (dark ab.), 35/-; *Deiopeia pulchella*, 6/-, 8/-, 10/- for single specimens, and 16/-, 22/-, 32/6, 52/6 and 30/- per pair. A pale ab. of *Arctia caia*, fore-wings cream-coloured, with a few central spots, hind-wings without spots, £12 2s. 6d; other aberrations producing 35/- (1), 16/- (4), 18/- (7), 40/- (7), 47/6 (8), 22/- (7), 35/- (7), 42/- (7); *Spilosoma menthastri* ab. *walkeri* caused 16/-, 22/-, 22/- to be bidden, and an ab. of *S. urticae* went for 26/-, *Laelia canosa* produced 14/-, 12/-, 18/-, 18/-, 21/-, 18/-, 22/-, 20/-, 21/- per pair, whilst *Lasiocampa ilicifolia* produced 35/-, 35/-, 37/6, 40/-, 42/-, 45/- per specimen, and *Drepana harpagula*, 18/-, 14/-, 10/-, 8/-, 14/-, 11/-, per pair. Two *Microdonta bicolora*, reputed as taken by Bouchard, at Killarney, produced 3 guineas each specimen. Two *Synia musculosa* (captor, J. Fielding, as late as 1871) went for

27/6 and 20/- each, whilst *Leucania albipuncta* dropped to 7/-, 6/-, 6/- and 12/- for 4. *L. vitellina* and *L. unipuncta* produced £1 each. Poor *Agrotis subrosea* fetched 28/-, 12/-, 12/-, 12/-, 12/- per pair. One is astounded at the giving of 12/- for a *Chariclea delphinii*, stated to have been "taken by F. Tickner, at Dover, in 1893." *Nyctina conformis* produced 10/-, 14/- and 12/- per pair, and *Cucullia graphalis*, 6/-, 12/-, 12/-, 12/-, 16/-, 14/- per specimen. An *Acontia solaris*, taken by Rev. Percy Andrews, in a clover field at Brighton, Aug. 25th, 1859, and recorded in the *Entom. Ann.*, 1860, p. 131, went for £3. *Thalporhars ostrina* produced 10/-, 8/-, 45/- apiece; *T. parva* 12/-, and *T. parva* 35/- . *Plusia ni*, from Mr. Bailey, Penzance, sold for 21/- and 60/- each, and *Catocala fraxini* for 12/-, 8/-, 30/-, 63/-, and an *Ophiodes lunaris* 21/- . *Venilia maculata* produced 30/- (1) for a suffused aberration, and 12/-, 37/6, 14/-, 12/-, 12/-, 12/-, 12/- per pair for the ab. *quadrinaculata*. A pair of hybrid *Emmonos angularia-albivaria* went for 10/-, and *Cleora viduaria*, 30/-, 24/-, 10/-, 6/-, 6/- per pair. Two specimens of *Acidalia perochraria* produced 22/- and 63/- respectively, and *A. ab. circumcellata* 30/- and 20/- for four specimens, whilst two aberrations of *Strenia clathrata* went for 27/6. An *Aplasta ononaria*, taken by Purdey, went for £3 5s., and aberrations of *Abraxas grossulariata* for £3 10s., 25/- (2), 18/-, 18/-, 12/-, 12/- 18/-, 18/-, 42/-, 14/-, 16/-, 18/-, 42/- apiece. A specimen of *Botys repandalis* sold for 21/- . *Chrysophanus dispar* fetched 37/6, 35/-, 30/-, 70/- (2), 94/6 105/-, 35/-, 37/6 (2), 25/- (2), 115/6, 8 guineas (a record price), 63/-; whilst in a Mr. J. H. Smart's collection, sold on Nov. 10th, specimens of the same species brought £6, £4, £4 15s., £2 10s. and £1 1s. each, and some rather poor *Agrotis subrosea* 26/- and 18/- per pair.—J. W. TUTT.

SECOND BROODS IN 1896.—The following are some of the second broods noticed during the past season. *Leucophasia sinapis*, on July 10th; *Tephrosia bistortata* and *Lophopteryx camelinæ*, about July 20th; *Drepana unguicula* and *Acontia luctuosa*, on July 23rd, although both were scarce as second broods; *Polyommatus astrarche*, very abundant, July 16th; *Lobophora viretata*, a single specimen, much smaller than those of the first brood, on August 1st; *Cupido minima* on August 17th; and *Polyommatus bellargus* on August 27th.—A. H. HAMM, Reading.

ACHERONTIA ATROPOS IN 1896.—Here, as elsewhere, the larvæ of *Acherontia atropos* seem commoner than usual. I have had five or six brought to me by potato-diggers this autumn.—N. M. RICHARDSON, B.A., F.E.S., Monte Video, Nr. Weymouth.

Of twelve *Acherontia atropos* larvæ brought to me this year, all were of the green form at first, turning to golden-yellow when quite full-fed. I heard of a dark brown one being taken.—E. A. BOWLES, M.A., F.E.S., Waltham Cross.

PRACTICAL HINTS.

Field Work for February.

By J. W. TUTT, F.E.S.

1.—The roots of *Artemisia* should be collected in February, for larvæ of *Ephippiphora foenæana*, *Dichrorampha simpliciana* and

Evarexia allisella. The larvæ of the latter mine up the new shoots in early spring, causing them to die.

2.—The larva of *Teichobia verhuellella* should be gathered during the winter and spring months. It mines the leaves of *Scolopendrium vulgare* (Hart's Tongue), and sometimes feeds on the indusia.

3.—“I observed the larva of *Butalis grandipennis* in the greatest profusion on the furze bushes on the steep hillside between Torrington and the river. The webs were, in February, quite a feature in the landscape” (Stainton).

4.—Beat thatch—whether straw-thatch or chip-thatch—stacks of bracken and hop-haulm. Hold the net directly under the place beaten, and catch everything that falls. Stacks of bracken, hop-haulm and thatch shelter *Coriscium brongniardellum*, *C. cuculipennellum*, *Laverna decorella*, *Gelechia humeralis*, *Gracilaria stigmatella*, *Depressaria ciliella*, *D. chaerophyllella*, *D. albipunctella*, *D. applanata*, *D. arenella*, *D. carduella*, *D. subpropinquella*, *D. propinquella*, *D. heracleiella*, *D. purpurella*, *Cidaria miata*, *Alweita hexalactyla*, and many other species, which may be sometimes beaten from such places in great abundance during the months of February and March.

5.—The cocoons of *Craniophora ligustri* are very hard, and feel lumpy under the moss on ash-trunks, or, if ivy be on the trees, they will be found adhering to the rootlets. The moss should not be pulled off, as it spoils the trees for another year.

6.—Dead wood on or about the roots of saw trees should be searched for the cocoons of *Cerura furcula*. They are often, also, at the base of a branch, or in a hollow where a branch has been pulled off.

7.—The fluffy spider-web-like cocoons of *Gnophria rubricollis* are spun under moss on oak trees.

8.—Collect, during the winter, stems of *Daucus carota* which have small holes in them, for *Conchylis francillana*.

9.—Roots of ragwort (*S. jacobaea*) dug during the winter will give larvæ of *Epheippiphora trigeminana*, *Eupoecilia atricapitana*, *Argyrolepis aeneana*.

10.—Collect the stems of sea-lavender (*Statice limonium*) for the larvæ of *C. limoniella*. “These larvæ feed on the flowers, eating out one of the petals and using it as a case, in which the larva moves about till full-fed in December; then, crawling down the stem, it eats its way inside, covering up the small hole with a slight web, soon after which the case drops off” (Elisha).

11.—Roots of *Daucus carota* should be collected in the winter months for larvæ of *Argyrolepis zephyrana*.

12.—Roots of tansy (*Tanacetum vulgare*), dug during the winter, give *Dichrorampha alpinana* and *D. saturnana*.

CURRENT NOTES.

Mr. S. J. Capper, F.L.S., has been re-elected (for the twentieth time in succession) president of the Lancashire and Cheshire Entomological Society; Mr. C. Nicholson, F.E.S., president of the North London Entomological and Natural History Society; Mr. R. Adkin, F.E.S., president of the South London Entomological Society; Mr. J. W. Tutt, F.E.S. (re-elected), president of the City of

London Entomological Society; Mr. R. Trimen, F.R.S., F.L.S., &c., president of the Entomological Society of London.

An excellent and successful exhibition of entomological and natural history specimens was held by the members of the North London Natural History Society, on Jan. 2nd, at the North East London Institute. The hearty thanks of the visitors are due not only to the members who arranged the exhibition, but also to Dr. Gerard Smith, for his photo-micrograph exhibition, and to Mr. F. J. Hanbury for the sight of part of his wonderful collection of plants.

We much regret to announce the death of Mr. W. T. Sturt, on Nov. 30th last, at the age of 45. He will be remembered by our readers as having bred *Sphinx convolvuli* from larvæ obtained at Port Wrinkle, about twelve months ago, when an account of the incident was published in our pages.

The members of the Entomological Club, and their friends, were invited by Mr. G. H. Verrall to dine with him, at the Holborn Restaurant, on the evening of January 19th. A most enjoyable evening was spent, Lord Walsingham, Prof. Poulton, Mr. Roland Trimen, Dr. Dixey, Mr. Distant, and other well-known entomologists being among the guests. Mr. Waterhouse exhibited an ingenious piece of work to show the phylogeny of the Lepidoptera, which, if not convincing in its results, was certainly of the greatest educative value. A strong provincial contingent was present.

The Presidential address of Professor Meldola to the Fellows of the Entomological Society of London has been printed separately. Everyone interested in entomology should read it. It summarises a number of theories which have long been floating about in a more or less indefinite form, and expresses somewhat clearly the principle for which we have been fighting the last five or six years, *viz.*, the importance of the physiological factors underlying all variation.

There seems to be an opinion among some of the leading Fellows of the Entomological Society that the subject of electing a president for one year, instead of two, should seriously be considered. It is the highest honour that the Society can offer its distinguished Fellows, and there are several world-renowned entomologists now awaiting their turn, which must come very slowly under the present conditions.

Mr. Rickard (*Entom.*) is still talking about "Fungi parasitic on butterflies." Will he not read Mayer's paper on the development of these androconial scales, and call them by their proper name?

Mr. Edward Saunders (*E.M.M.*) believes that *Bombus pratorum*, *jonellus*, *lapponicus*, *alticola* and *pyrenæus*, in all of which the ♂ armature is practically identical, are all forms of one variable species. He also says that the insect known as *Bombus smithianus* is a form of the Continental *B. cognatus*.

Mr. Newstead (*E.M.M.*) adds the Coccid, *Aspidiopus hederæ*, to the British list, from specimens obtained from holly leaves gathered at Teddington.

Mr. Eustace Banks (*E.M.M.*) describes the larva of *Aristotelia* (*Gelechia*) *tetragonella*, obtained from *Glaux maritima* during May, and the larva and pupa of *Depressaria pulcherimella*, the former found feeding on May 31st, under a slight silken web, on flowers and young seeds of *Conopodium denudatum* (*Bunium flexuosum*). In describing the first of these, he "follows such well-known writers as Messrs.

Buckler, Stainton and Drs. Chapman and Wood, in counting the head as the 'first' segment of the larva." We are pleased to see that, in the description of the second, he appears to have followed Dr. Chapman's later practice.

Mr. C. G. Barrett adds *Platyptilia tesseradactyla* to the British list, from specimens captured by Mr. W. F. de V. Kane and the Hon. R. E. Dillon, at Clonbrock, in the first week of June, 1895. This species is very like *P. gonodactyla*.

SOCIETIES.

ENTOMOLOGICAL SOCIETY OF LONDON.—January 20th, 1897, the 64th Annual Meeting.—Prof. Raphael Meldola, F.R.S., president, in the chair. An abstract of the treasurer's accounts, showing a balance in the society's favour, having been read by one of the auditors, the secretary, Mr. H. Goss, read the report of the council. It was then announced that the following gentlemen had been elected as officers and council for 1897:—President, Mr. Roland Trimen, F.R.S.; treasurer, Mr. Robert McLachlan, F.R.S.; secretaries, Mr. Walter F. H. Blandford and Mr. Frederic Merrifield; librarian, Mr. George C. Champion; and as other members of the council, the Rev. Canon Fowler, Mr. Herbert Goss, Sir George F. Hampson, Bart., Herr Martin Jacoby, Prof. Raphael Meldola, F.R.S., Mr. Osbert Salvin, F.R.S., Mr. James W. Tutt, and Mr. G. H. Verrall. The President then delivered an address, and took for the subject, "The Utility of Specific Characters from the Point of View of the Darwinian Theory." His remarks had reference to the paper on this subject, read last June before the Linnean Society, by Dr. A. R. Wallace, and the subsequent discussion. Prof. Meldola pointed out that the question of "utility," as necessitated by the theory of natural selection, had hitherto been made to depend too exclusively upon external and visibly manifest utility, a restriction which he did not believe to be warranted by facts. He argued in favour of a connection of the nature of correlation between apparently trivial external characters and latent physiological characters of great importance to the welfare of the species. From this point of view it was contended that the diagnostic characters used for purposes of description did not truly represent the sum total of the characters which must be regarded as specific. The president concluded by referring to the losses by death during the year of several Fellows of the Society and other entomologists, special mention being made of Mr. A. S. Olliff, Mr. Edward Armitage, R.A., Mr. Peter Inebald, Miss G. E. Ormerod, Mons. Auguste Sallé, Mr. Arthur Dowsett, Herr Julius Flohr, Mr. J. Chappell, and Dr. Morawitz. A vote of thanks to the president was proposed by Lord Walsingham, F.R.S., seconded by Mr. Osbert Salvin, F.R.S., and carried. A vote of thanks to the officers was then proposed by Prof. Poulton, F.R.S., seconded by Mr. R. Trimen, F.R.S., and carried. Prof. Meldola, Mr. McLachlan and Mr. Goss replied, and the proceedings terminated.

CAMBRIDGE ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.—A meeting of this society was held on Jan. 15th.—EXHIBITS.—Mr. Fleet exhibited a good specimen of a large weevil (*Cleonus nebulosus*) from the crop of a stone curlew, purchased in the market. It was suggested

that a probable locality for both bird and beetle was Brandon. Dr. Sharp exhibited a fine mass of the cocoons of *Aphomia sociella*, picked up in the neighbourhood. Also some remarkable Dipterous larvæ, viz., an undescribed Tabanid larva, from the New Forest, with feet disposed all over the body, and somewhat allied to *Tabanus spodopterus*: he thought it might be the larva of *Atylotus*; larva of *Scenopinus fenestralis*, from Bucks; he called attention to the importance of ascertaining whether this larva is injurious, as commonly supposed, or whether it is present in woollen goods only to destroy other larvæ, such as those of the clothes moth; larva of *Microdon*, found in Portugal, by Colonel Yerbury, which shows no sign of segmentation. Also *Idolothrips spectrum*, sent by Mr. Froggatt, from New South Wales.

SOUTH LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.—Jan. 14th, 1897.—ABERRATIONS OF NOCTUID MOTHS.—Mr. Routledge exhibited specimens of *Phaëtra menyanthidis*, from Carlisle, with a white thorax; *Xylophasia rurea* from N. Devon, light grey, with fine lines; *Agrotis segetum*, with silvery fore-wings and unusually white hind-wings; *Noctua c-nigrum*, with the c reduced to two spots, and a *Triphaena pronuba* from Epping, with lunules on the hind-wings. TEPHROSIA BISTORTATA AND T. CREPUSCULARIA (BIUNDULARIA).—Mr. R. Adkin: *Tephrosia bistortata* bred spring brood, March and April, and summer brood, June; some of the latter being equal in size to the former; *T. crepuscularia* (*biundularia*), bred May, all from the London district. MELANIC DIANTHOECIA CAPSOPHILA.—Also, on behalf of Mr. W. F. de V. Kane: *Dianthoeia capsophila* from a small island off the Kerry coast, with examples from Howth and Isle of Arran (Galway) for comparison. The Kerry specimens were unusually dark for the species, and were bred. ABERRATIONS CAPTURED IN YORKSHIRE.—Mr. Hewett, of York, exhibited a varied series of *Taeniocampa munda* from York, including a fine mahogany-coloured form; a melanic ab. of *T. pulverulenta*; a series of abs. of *Abraças grossulariata*, including a specimen of the ab. *variegata*, bred from a wild larva; the various forms of *Spilosoma lubricipeda*, including a series of intermediate forms; a preserved hybrid larva from ova laid by a female *T. munda*, taken *in cop.* with a male *T. stabilis*, at York, 1896 [Mr. Bacot considered the larva typical *munda*]; series of abs. of *A. sylvestra* (*ulmata*), one being suffused, and several unusually free from markings; three females of *Odonestis potatoria* of the male coloration; and three *Saturnia pavonia*, one having the left hind-wing very pale, one very dark male, and a female having hind-wings approaching the male coloration. IRISH LEPIDOPTERA.—Mr. Barrett, on behalf of Mr. Kane: a specimen of *Boarmia repandata* ab. *destriaria*, *Phothodes captivuncula*, and *Acipitilia tetralactyla* from Ireland. INBRED EUPITHECIA CONSIGNATA.—Also *Eupithecia consignata*, bred in-and-in by Mrs. Hutchinson continuously since 1874, and only on one occasion, some ten years ago, had a wild strain been introduced. At first they gradually decreased in size, but after the introduction of a wild strain, and the sleeving out process, they increased in both size and depth of colour. ACHERONTIA ATROPOS AND ITS ABERRATIONS.—Mr. Tutt: a long series of *Acherontia atropos*, bred by Mr. Burrows, of Rainham, showing considerable variation in the colour of the "skull," and said that he did not consider the species adapted to exist in this country. They were forced,

JAPANESE TEPHROSIAS.—Mr. South exhibited a series of Tephrosias allied to *T. bistortata*, from Japan and other Eastern Asiatic localities, which proved exceedingly interesting. LARVA OF APLECTA OCCULTA, ETC.—Mr. McArthur: a living larva of *Aplecta occulta*, and a bred series of *Heliothis peltigera*. VARIATION OF SPILSOMA LUBRICIPEDA.—Mr. Young, of Rotherham: a very long series of *Spilosoma lubricipeda* var. *satima*, and ab. *fasciata*, and an ab. very closely resembling ab. *deschangepi*. It was noted that all British entomologists who bred this species obtained intermediate forms freely, while it was not so on the Continent. TEPHROSIA BISTORTATA AND *T. CREPUSCULARIA*.—To illustrate his paper, Mr. Hewett exhibited very long series of both broods of *T. bistortata*, and also series of *T. crepuscularia*. These were from some 50 or 60 different localities. Most of the known forms were shown, as well as preserved larvæ. On behalf of Mr. W. F. de V. Kane, the latter species from Irish localities, and both species from Swansea, on behalf of Major Robertson. He then read a most exhaustive paper on these two species. He first paid a tribute to Mr. Prout's work on the synonymy of these species. Included in the paper were, he said, the observations and experiments of more than fifty well-known entomologists, who had been interested in this question. In the discussion which followed, Mr. South asked: (1) Did any character exist by which the species could be separated with absolute certainty? (2) Which was the commoner species? To the latter, members agreed that *T. crepuscularia* was very local, while *T. biundularia* was more common. Mr. Tutt thought that here were examples of recent evolution, in fact, we had species in the making, as in the case of some of the *Zygenas*. He insisted that the naming of the two forms, and the consideration of them as distinct, although very closely allied, were matters of convenience, necessitated in our comparisons with Continental and Asiatic representatives. Mr. Bacot stated that there was a distinct difference between the larvæ of certain broods that he had had under observation, he could have easily separated 80 per cent. of the larvæ, although so closely allied.

THE NORTH LONDON NATURAL HISTORY SOCIETY.—Dec. 24th, 1896. —A NEW BRITISH SPECIES OF DIPTERA.—Mr. Jennings: *Micropalpus pulicus*, Rondani, a species new to Britain, taken at the flowers of a tall Umbellifer, in a wood near Colchester, 19th Aug., 1896. He mentioned that there were other reports of captures of the species this season. MOTHS ATTRACTED BY ELECTRIC LIGHTS ON A SHIP AT SEA.—Mr. Bacot read the following extract from a letter from Mr. Quail, written on board the R.M.S. "Ophir," en route for New Zealand:—"Off the coast of Ceylon, about 150 miles from Colombo, the electric lights on board attracted a number of species of *Agrionidae* (Neuroptera), as well as a number of a species of a clear-winged Sphingid (*Macroglossinae*). This latter species has a power which is remarkable, and worth recording. It has three distinct anal tufts: that on either side is black, the centre one is yellow. When the insect is settled these tufts cover the extremity of the anal segment, and the abdomen has the appearance of terminating in a somewhat pronounced point. When in flight, or if alarmed, however, the side tufts are extended in a fan-like manner, and form two flat black semicircles at the end of the abdomen. The hairs of the tuft are about $\frac{1}{16}$ of an inch in length. It would be interesting to know the use of this habit of extension. It is a coin-

vidence that these, the only insects attracted at this place, were both clear-winged. Of course, both are strong fliers. On shore, at Ceylon, I took a small "micro," white in colour, with black tufts, similar to the above, but I did not notice a corresponding power of extension. In the neighbourhood of Ceylon one specimen of *Papilio machaon*—which I had brought with me—emerged from a drab-coloured pupa. The only green-coloured pupa—spun on natural leaves—appears inclined to go over. At any rate, it has stood the intense heat of the equator." INSECTS IN THE ISLAND OF CEYLON.—"There were a great many Neuroptera on shore at Ceylon. I also noticed a yellow Coliad—which here replaces the Pierids of England in point of quantity—with black borders, which give the appearance of torn and tattered wings when the insect flies. One specimen of a Reduviid (Heteroptera) came to light, as well as some Hymenoptera and Diptera."

THE CITY OF LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY. —January 19th, 1897.—CAPTURES AT BROCKENHURST AND LOUGHTON IN 1896.—Mr. E. Heasler: a series of *Aplecta prasina* (*herbida*) taken at sugar, in June last, at Brockenhurst; series of *Hylophila bicolorana*, bred from larvæ taken at Loughton, and *H. prasinana* captured at sugar in the New Forest. DARK ABERRATION OF *ACHERONTIA ATROPOS*.—Mr. J. A. Clark: a dark specimen of *A. atropos*, the larva being taken at Walthamstow, in August, and imago emerging Nov. 25th. ABERRATIONS OF *ANGERONA PRUNARIA*.—Mr. Clark: also picked variable forms of *A. prunaria* var. *sordidata*, 6 males, 4 females, bred from ova laid by a female, the last of three impregnated by the same male. The brood consisted of 82 larvæ, of which about 65 successfully passed through all stages. Amongst the males, variation occurred in the size of the orange marking near the apical angle of fore-wings, which marking coalesced with the central orange area in one specimen; in another, the orange area was streaked with black lines. A female was asymmetrically marked, the left hind-wing being without the broad dark border present on the right. ABERRATIONS OF *AGLAIS URTIÆ* AND *PIERIS RAPÆ*.—Also *A. (Vanessa) urticæ*, caught in August last, at Ponder's End, with the black spots at costal margin much suffused, and the two outer confluent. Also two abs. of *P. rapæ* from the same locality, the upper wings of one, a male, being almost perfectly white, with no darkening at tip of fore-wings, and the black spot in the middle showing dimly; the second, a female, having the hinder of the two spots on the upper wing in duplicate. LARVÆ OF *TROCHILUM CRABRONIFORME*.—Mr. G. R. Garland: larvæ of *T. crabroniforme* (*bembeciformis*) from Manchester, feeding on wood of willow. *NYSSIA ZONARIA*.—Mr. Garland also exhibited a series of *N. zonaria* taken at Blundellsands, near Liverpool; and a sample of cotton made by a new patent process to imitate silk. *DASYCHIRA PUDIBUNDA* EMERGING IN NOVEMBER.—Mr. D. C. Bate: Five well-marked male and one female *Dasychira pudibunda*, bred from larvæ with black hairs; all emerged in November, having been kept indoors. *POECILOCAMPA POPULI*.—He also exhibited *P. populi*, the larva being beaten at Dorking. DWARF *HYBERNIA DEFOLIARIA*.—In endeavouring to breed *H. defoliaria*, Mr. Bate said his imagines emerged dwarfs, three being exhibited. The larvæ were obtained at Dulwich, and wild moths shown from the same locality were of normal size. Mr. Clark suggested the dwarfing was, perhaps, caused by keeping the larvæ too dry. HISTORY OF SILK.—Mr. L. J. Tremayne read a paper entitled "The History of Silk," and a vote of thanks was heartily accorded him.

The Entomologist's Record

AND

JOURNAL OF VARIATION.

VOL. IX. No. 3.

MARCH 15TH, 1897.

Notes of a few days' collecting at Wallasey (Liverpool), and in the Valley of the Dee above Llangollen.

By PROFESSOR T. HUDSON BEARE, B.Sc., F.R.S.E., F.E.S., and
HORACE DONISTHORPE, F.Z.S., F.E.S.

Having made up our minds to secure specimens of *Cicindela hybrida*, and to try our luck on the Welsh hills, we left London by the 5.30 p.m., for Liverpool, on Thursday, May 14th, 1896.

Friday morning broke dark and gloomy, with heavy rain, not an inspiring outlook when the object in view was such a sun lover as a tiger beetle; however, by the time breakfast was over the weather broke, and prospects seemed somewhat fairer. A short journey by train, during which we dived under the Mersey to gain the Cheshire side, soon landed us on the sand-hills. Adopting the hints received, we made for the shore, and then struck along it till the spot was reached where the insect is usually taken. By this time the sun was out hot and strong, making the heavy going somewhat fatiguing. Leaving the shore, we plunged again into the sand-hills, which are fairly high and decidedly steep, more especially as each foot up means a slide back of about the same amount, and one's boots were soon filled in all their spare crevices with fine sand. For some time careful stalking up one side and down the other was all in vain, and hope began to sink, when a loud shout from one of the twain announced the capture of the first specimen. This proved we were on the right spot, and the capture of a series for each was now but a matter of time and labour.

Labour indeed it was; up rises a specimen at your feet, too quick for any attempt to strike with the net, and makes a bee-line for the next sand-hill. A wild charge down the one and up the other may secure for you the insect, or it may only enable you to arrive in time to see it make another bee-line for a still further spot, or, perhaps, back to where you first started it. However, hard work and patience at length secured the desired result, and having obtained our series of this extremely agile and beautiful beetle, we rest for a few minutes to cool down and get rid of some of the sand which fills boots and clothes generally.

As we were bound to be in Chester that afternoon, in order to carry out our programme, we had no time to look for anything else on the sand-hills, and only picked up a few casual specimens here and

there. We tried on the shore for *Homalium rugulipenne*, a very local insect, but were not lucky enough to come across it.

The other things taken were:—*Calathus flavipes*, *Sitones griseus*, *Leistus fulvibarbis*, *Microzoum tibiale*, etc. It is, perhaps, as well to point out that *C. hybrida* is the only form which occurs on these sand-hills; the allied species, *C. maritima*, does not, we were informed by local collectors, occur there, and certainly we saw no sign of it.

Returning to Birkenhead, we took train to Chester, and thence by the Dee Valley line through Llangollen, to the quaint little village of Carrog. While tea was preparing we strolled down to the river, and were lucky enough to secure at once, by splashing the shingle, two good *Bembidia*, namely, *B. punctulatum* and *B. prasinum*, both being fairly common. Several other generally distributed insects, such as *Pterostichus strenuus*, etc., also occurred under stones in the dry part of the bed—the long drought had made the river very low—darkness, however, soon put a stop to our collecting.

Saturday morning saw us early afoot. Crossing the river, we gradually worked our way up the slopes of the opposite mountains. Beating hawthorn blossom, we secured specimens of *Telephorus obscurus*, a choice insect for southern eyes, and birch similarly yielded *Corymbites quercis* and *Pogonochaerus hispidus*, naturally, many other common things dropping at times into our nets. A little higher up, when the trees began to become very stunted and sparse, we crossed a small mountain rannel (after a hearty drink, not much enjoyed a little later, when we came across a dead rabbit lying in the water a few paces higher up), and searched carefully the moss lining its tiny banks. Here some nice things came to hand—we were evidently amongst genuine mountain fauna—*Gymnusa variegata*, *Tachinus elongatus*, and a *Lathrobium*, which caused much trouble in identification. Eventually it was decided that it must be a small unspotted variety of *L. terminatum*. This Dr. Sharp has confirmed; he says “it is a beautiful small and dark variety. I can almost match them from Scotland, but not quite; my variations do not go to this extreme.”

Leaving this stream and crossing a stone wall, we are at length on the open mountain side, amongst the heather, which grows thickly and strongly all over these upland slopes, making the walking very trying. The only form of collecting possible here is by turning over stones (though we find under sheep's dung the mountain *Aphodius lapponum* in plenty). The first truly mountain form we come across is *Calathus micropterus*, then soon *Pterostichus vitreus* puts in an appearance, and presently, under stones close to the rough foot track, which winds away over the mountain side to the distant slate quarries, some beautiful specimens of *Carabus glabratus* turn up, a most splendid insect, and perhaps, the most interesting of all our captures; *C. catenulatus*, of course, occurs. A *Pterostichus*, very like the common *madidus*, is now and again found under stones, but a closer look at once reveals that it is the mountain form, always, too, a scarce insect, *aethiops*. Neither of these insects just mentioned has been, we believe, taken on these hills before, though they occur on the higher mountain masses of the Snowdon range. Of the other things found under the stones, we may mention *Pterostichus nigrita*, *Ocyptus brunnipes*, *Lathrobium brunnipes*, *Cryptohymnus riparius*, *Bradycellus collaris*, *cognata*, *similis*, etc. Some of these are mountain insects, others, of

course, occur freely in the low lands. Eventually we reach the cairn which marks the summit. A few insects are found under the stones at the foot of the cairn, but there is not much to tempt one to remain on this bleak and bare summit, with its half-dried pools of inky black peat water (the drought has evidently been very severe up here), so we soon start on the return journey. On the way down, in a sheltered little glen, a number of specimens of that beautiful insect, *Corymbites aeneus*, occur under stones, its usual habitat.

Tired out, but thoroughly satisfied with our day on the mountains, we regain the little inn, and after a good meal, set off by train up the river valley to Berwyn, to meet Mr. W. E. Sharp, of Liverpool, who had promised to join us for a day.

Sunday was a beautiful day, only rather too hot for climbing the slippery dry mountain slopes. Our special object was *Miscodera arctica* and *Cymindis vaporariorum*, two purely mountain insects; but first of all, there was a possibility of something very good close at hand. This was the spot on the Dee where that little rarity, *Perileptus areolatus* had been once or twice captured, so down to the shingly bed we go, in great hopes of adding this to our takings. It has generally been captured flying, but, though the sunshine was bright and strong, none were about, so going down on our knees, we carefully searched the fine shingle thrown up into the crevices of the great rocky bars which here cross the river, and after much labour and toil at this, varied by throwing masses of the shingle into still pools in the river, we did at length secure a few specimens each, not enough to make one, however, feel thoroughly satisfied with the work. *Bembidium decorum* and *B. atrocaeruleum* also turned up. But time was hurrying on, so, leaving the river, we start on our upland journey. The hillside is terribly dry and burnt up, and insects are very scarce, a fine *Cyclhrus rostratus* being about the best thing till we get quite close to the summit. There the ground flattens out a bit, and stones become more numerous, though the moisture is still very much wanting; however, one of our desires, *C. vaporariorum*, turns up in fairly large numbers, with it *Olisthopus rotundatus* and *Carabus arvensis* occur, some most beautiful specimens of the latter, and, of course, several of the other mountain forms we had taken on the Saturday, but, alas, *Miscodera* is conspicuous by its absence; the drought has evidently been too much for it, as Mr. Sharp has taken it at this time of the year on these slopes.

Descending from the ridge, we try our luck with a water net, in a small pool used for watering sheep. There is, however, not much except *Agabus bipustulatus* v. *solieri* and *Hydrophorus nigrita*. Another summit is breasted in hopes of *Miscodera*, but in vain, and at length, as the day is rapidly waning, we give up the chase and make once more for the river valley.

A little waterfall close by the hotel is our last spot. Here out of the wet moss we wring *Dianous caeruleus*, *Stenus gypimeri*, *Lestica pubescens*, *Philonthus bipustulatus*, and a few other of the water-fall loving Staphs.

This is the closing scene of our mountain trip: a hurried meal, and we catch a local to take us back to Chester, from whence a night express soon lands us, early on Monday morning, once more in London, with bottles full enough of choice things to keep one busy for many a day setting and naming.

Contributions to the fauna of the Dauphiné Alps.

III.—THE LEPIDOPTERA OF BOURG D'ARU.

By J. W. TUTT, F.E.S.

I spent Tuesday, August 18th, 1896, at Bourg d'Aru, and collected along the road leading from there to Bourg d'Oisans, as far as the point at which the Val de Vénéon joins the Romanche Valley. It seems advisable to put on record the insects observed and captured in this delightful spot, though a day's work must give but a poor contribution to the fauna of this valley. The road is an incline, rising to about 3,500 feet at Bourg d'Aru, and falling to about 2,400 at the junction of the two valleys. High mountains covered with glaciers bound each side of the Val de Vénéon, which, in places, is narrow, rocky and precipitous. At other times it widens considerably, admitting of a little cultivation on the slopes extending from the bed of the river to the foot of the mountains. The sun disappears from the valley by 3 p.m., so the day is necessarily a short one. Many insects that I had found common at Bourg d'Oisans, and that offered no variation from the specimens obtained there, were not captured, and as I kept no record of these species, they are not mentioned.

PAPILIONIDES.—Fam. LYCÆNIDÆ.—*Polyommatus corydon*.—Not abundant, the males with pale undersides, the females not shot with male coloration. *P. bellargus*.—Not abundant. The males taken were amongst swarms of *P. damon*, drinking at the little puddles in the roadway. *P. icarus*.—Abundant, the ab. *icarinus* appeared also to be rather common. *P. escheri*.—This beautiful grand-looking *icarus*-like species was scarce and going over; a few females occurred. *P. astrarche*.—Rather common, and not unlike British specimens; the orange spots round the margins of the fore- and hind-wings fairly well developed. *P. damon*.—In swarms. There were literally hundreds at some of the little wayside pools made by the streams that broke through the rocky precipices bounding the valley. Both sexes were equally well represented; the males, of course, are more conspicuous. Fam. PAPILIONIDÆ.—*Papilio podalirius*.—Very abundant, both in the clover fields, on the flower heads, and also at the puddles in the road. *P. machaon*.—Seen now and again all day, but not common. Those netted were of large size, and mostly damaged. One freshly emerged specimen, that still had slightly limp wings, had one tail entirely absent (probably bitten off by a lizard). Fam. PARNASSIDÆ.—*Parnassius apollo*.—Scarce, but occurring all along the valley. Probably more abundant in suitable spots at a higher elevation. I observed this species fighting furiously with *Satyrus actæa*. Fam. PIERIDÆ.—*Pieris napi*.—Common. Specimens of both sexes very lightly marked on the upper and under sides. *Colias edusa*.—Only about five specimens observed. The species was exceedingly rare. Of those captured, two were worn and two freshly emerged. *Colias hyale*.—Fairly common, and within narrow limits variable. I captured only six specimens. Four of these showed a tendency to the ab. *intermedia*. Many specimens, however, that I observed at rest, were moderately well marked on the margins. *Gonepteryx rhamni*.—Next to *P. damon*, the commonest butterfly. I must have seen thousands in the course of the day, but there was no time to overhaul them for aberrations. Many of the females appeared more yellow than is usually the case, and

there was in this direction a general tendency towards the ab. *intermedia*. *Leucophasia sinapis*.—The second brood was abundant; but evidently going over. The ab. *diniensis* and ab. *erysimi* both occurred. Fam. NYMPHALIDÆ.—*Melitaea didyma*.—Going over, the species had evidently been abundant. *Brenthis dia*.—Fairly abundant, and in good condition. *Argynnis aglaia*.—This species was rare, and appeared to be so throughout the whole of the Romanche and Vénéon Valleys. *A. niobe* ab. *eris*.—One specimen only seen and captured. *A. adippe*.—The abundant species of this genus; abounded in suitable places, but was going over. *A. lathonia*.—Not uncommon, but seen much oftener than caught. When *A. lathonia* is in the humour it can move, neither species of *Colias* can touch it for mere speed. *Dryas paphia*.—Abundant, with the last species on a rough slope just before the Vénéon Valley joins the Romanche Valley. This rough slope, down which I came once or twice more rapidly than I went up, was the favourite haunt of *Erebia neoridas*, *Satyrus actaea*, *Parnassius apollo*, *Argynnis adippe* and *Dryas paphia*. These, with the two *Papilio*s and a few other species, fought for a place on the thistle-heads, which grew there somewhat abundantly. The specimens of *D. paphia*, however, were all more or less damaged. *Limenitis camilla*.—Two or three male specimens only seen. These were in good condition, but very small. *Euranessa antiopa*.—Not uncommon. I caught only one specimen. One reviewer, in slating my *British Butterflies*, says it isn't much of a book, because the author has left out so many important facts. He illustrates this by stating that I had left out of the letter-press connected with *Colias edusa*, the fact that this "species flies faster than all other British butterflies!!" and then quotes the good old tale about Alpheraky's dragoon, which Kirby had served up again in the part of his *Butterflies* (Lloyd's) the week before the review appeared. I should like to put *E. antiopa*, *A. lathonia*, *C. edusa* and *C. hyale* in a line, give them a fair start, and set this entomological (?) reviewer running after them. If he caught any (he probably wouldn't) it would not be *E. antiopa*, nor *A. lathonia*. You can stalk them, but you may as well try to run down a swallow as *E. antiopa* when it is on the move. I stalked one specimen; it took me some 25 minutes to get it, and time would not allow of a repetition when so many things were wanted. This merely in explanation of my enormous catch of a "not uncommon" species. *Vanessa io*.—Fairly abundant in the clover fields, and apparently quite typical. *Pyrameis cardui*.—Rather rare, the specimens I noticed were all apparently freshly emerged. *Polygonia c-album*.—One poor specimen (of the ab. *pallidior*, Pet. = *hutchinsoni*, Robs.) only seen and captured; evidently passé. Fam. SATYRIDÆ.—*Hipparchia hermione*.—Not uncommon, but getting very ragged, especially the males.—*Satyrus actaea*.—All the specimens observed were exceedingly pale, the females apparently of the ab. *bryce*, Hb. *Epinephile lycaon*.—Fairly abundant in restricted localities. *E. ianira*.—Moderately abundant, with the last species. *Coenonympha arcania*.—Practically over, I obtained two poor specimens only. *Erebia neoridas*.—Not uncommon, all along the valley on broken ground; in one place abundant, but I got no females. The species puzzled me a good deal. The books say that it is like *E. aethiops*. I consider it, both in its habits and general appearance, much more like *E. pronoe*. In spite of its dark underside, the pale dusting makes it

very inconspicuous when at rest. *Erebia aethiops*.—One female specimen only, in fine condition.

NOCTUIDES.—*Apamea didyma*.—One specimen on a flower-head in the sun; of the ab. *oculea-flavo* form. *Plusia bractea*.—A lovely male, found whilst drying its wings on a grass stem, at about 10 a.m.

CHELONIIDES.—*Callimorpha hera*.—In great force, and in excellent condition. All along the valley, from about 10 a.m. till 2 p.m., this species was to be disturbed from the flowers, basking in the sun, sometimes two or three specimens on a single flower-head. It was also scattered all over the clover fields, sucking honey from the flowers. I did not see a single specimen of ab. *lutescens*, nor of ab. *saturnina*. *Lithosia complana*.—Odd specimens were to be obtained here and there, seated on the scabious flowers in the sun. *L. luridicola*.—A few odd specimens obtained in the same way as the last. *Setina irrorella*.—The specimens here were marked like typical *irrorella*, but they were of a rich golden ground-colour, and may be an allied species. *Lithosia lutarella* ab. *pygmaeola*.—The ordinary British form of this species (ab. *pygmaeola*) occurred here, and not the usual richly-coloured Alpine type. This was remarkable and unexpected, as at La Grave, only a few miles away, but at 2,000 feet greater altitude, the golden *lutarella* abounded. Some entomologists still throw doubt on these being the same species, because the more golden colour of *lutarella* is accompanied by a darker underside, but I suppose no one has caught more specimens of *lutarella* and *pygmaeola* than myself, and I have no doubt of their being the same species.

BOMBYCIDES.—*Porthetria dispar*.—The males exceedingly abundant, flying everywhere, the females seated on the perpendicular faces of the rocks.

SATURNIIDES.—*Saturnia pyri*.—The beautiful larvæ would have proved abundant, I believe, had they been closely searched for. I found several full-fed ones, on one little bush of *Ilex*.

GEOMETRIDES.—*Strenia clathrata*.—Common here and there. The specimens quite typical. *Acidalia marginipunctata* (*promutata*).—One typical specimen. *Larentia olivata*.—One or two specimens disturbed from the sides of a rocky gully. *Coremia ferrugata*.—One moderately typical specimen only occurred. *Eubolia bipunctaria*.—Common, of a rather deep grey colour, and well defined transverse bands, rather like the darker aberrations found among British specimens. *Phibalapteryx tersata*.—One specimen, of a grey tint, in fine condition, disturbed from a mass of clematis, which was very abundant all over the district. *Eupithecia impurata*.—One specimen, in poor condition, disturbed whilst resting on a rock.

PYRALIDES.—*Orobena limbalis*.—One specimen disturbed from the herbage in a steep gully. *Botys nebulalis*.—One specimen disturbed in the same locality as the last.

CRAMBIDES.—*Crambus falsellus*.—A few specimens only observed. These were not quite so pale as the Grésy-sur-Aix specimens. *Crambus culmellus*.—Very abundant.

GELECHIIDES.—*Gelechia tripunctella*.—Several specimens, in fine condition. The species was rather common.

PTEROPHORIDES.—*Minaesoptilus coprodactylus*.—Abundant, as usual. *Aciptilia tetradactyla*.—Abundant, and just like British specimens.

ZYGENIDES.—*Zyggaena carniolica*.—Abundant, the creamy markings better developed than in the Bourg d'Oisans examples.

TORTRICIDES.—*Tortrix ribeana*.—Only one Tortricid appears in the day's take. This is a specimen of this species.

HEPIALIDES.—*Hepialus sylrinus*.—A large ♀ specimen of this species was found in the net, probably swept up from the grass.

A new British Flea (*Typhlopsylla pentacanthus*).

By the HON. CHARLES ROTHSCHILD, F.Z.S., F.E.S.

Typhlopsylla pentacanthus, sp. nov.—Front of the head slightly angulated, bearing five genal spines, of which the first two and the fourth are of equal length, the fifth is half the length of these, and the third is the longest. Pronotum with fourteen spines. The posterior edges of the first and second abdominal segments bear four spines, and those of the next three two apiece. The seventh abdominal segment bears at the apex, on the dorsal side, four long bristles. The hinder edges of all the tibiae are marked with six incisions, bearing six pairs of strong bristles, gradually increasing in length from the base to the apex of the tibia.

Parasitic on *Mustela vulgaris*, *Arvicola agrestis*, and *Mus sylvaticus*.

The above description is taken from a female specimen, caught on a weasel (*Mustela vulgaris*), at Tring, in 1894. We have, however, examined several other examples of this interesting insect, both in our own and in Mr. Edward Saunders' collection, and hope to publish notes on the male soon.

A critical resumé of the arguments for and against *Tephrosia bistortata* (crepuscularia) and *Tephrosia crepuscularia* (biundularia) being considered distinct species.

By J. W. TUTT, F.E.S.

(Concluded from p. 32).

I have previously suggested that the records of the capture of specimens of a second brood of *Tephrosia biundularia* at large (*T.M.M.*, xxiii., p. 86, and *Proc. Sth. Lond. Ent. Soc.*, 1890, p. 25), by Mr. C. G. Barrett, are probably erroneous, and that all the specimens referred to belong to *T. crepuscularia*. This opinion has been considerably strengthened by the examination of the specimens exhibited by Mr. Barrett for Mrs. Bazett, on Sept. 10th, as individuals of the second brood of *T. biundularia*. They are (to me) palpably specimens of the second brood of *T. crepuscularia*, exactly similar to many bred specimens in my own series, and it appears to me, therefore, very probable that the previous captures of Mr. Barrett were the same. To my knowledge there are but three records, in two cases of single individuals only, of a second brood of *T. biundularia*. These are:—(1) Mr. Cooper reports breeding *T. biundularia* in August, 1896, from an egg laid by a female captured the previous June, the larva having fed upon knot-grass (*Proc. Sth. Lond. Ent. Soc.*, 1886, p. 56). (2). Mr. Bayne, on Nov. 3rd, 1894, captured a specimen of the second brood of *T. biundularia*, in Epping Forest, near Chingford. It was

a female, badly crippled, and died without ovipositing. I have personal knowledge of Mr. Bayne's intimate acquaintance with this insect in Epping Forest, and his judgment may be considered as conclusive on the point of the insect's identity. (3) This is a general statement made by Mr. Robson, that "the offspring of both insects in favourable seasons or localities feed up and emerge the same year, or part of the brood does. The second brood, in both species, presents the same characteristics as the first, slightly modified only, as is usual in second appearances" (*E.M.M.*, xxiii., p. 111). Mr. Robson does not say that he has bred them, although I suppose we may assume that he has. [Whilst this paper has been going through the press, Mr. Robson has stated more exactly his knowledge of a second brood of *T. biundularia*. He says (*E.M.M.*, xxxii., p. 267): "I have only once had a second brood of *T. biundularia* here (*crepuscularia* does not occur). They were smaller, less distinctly marked, more suffused than the type, and the ground-colour not so white."] I do not wish to lay more value on this point—the rarity of partial double-broodedness in *T. biundularia* in confinement, and its frequency in *T. crepuscularia*—because it really only betokens a difference of habit, which, whilst it supports the theory of two species, does not prove it. The separation of these two allies into species is based on a number of independent characters, and that they have two quite distinct life cycles in a state of nature.

I have known lepidopterists who speak of *T. crepuscularia* as the larch-frequenting species. It is perfectly true that *T. crepuscularia* is exceedingly abundant in many larch woods, but it is equally abundant in woods of mixed growth. At Clevedon, Reading, and many other recorded localities, it is said to be abundant in larch woods. At Chattenden, it is common where there are no larches, and where the wood consists essentially of oak, ash, hazel, etc. At West Wickham it is abundant in woods of mixed growth, and in a wood at Cuxton, where beech and oak are the principal trees. On the other hand, *T. biundularia* is abundant at Cuxton, in another wood, chiefly composed of beech, oak and pine, and so on. There is no very especial attachment of either species to a certain tree.

This brings us to the strange fact that, in some woods both species occur, and maintain their distinctness side by side. I have already instanced the New Forest and Birch Wood. But in my experience this is not usually the case. It would seem that the conditions suitable for one species are rarely suitable for the other, and hence their localities usually lie in separate, though they may be adjacent, woods. Mr. Doubleday's observations, already quoted, emphasise this point. Mr. Chappell (*Entom.*, xix., p. 254) gives a similar result of his experience. He found the species in different localities, and there were no intermediate forms.

The mixture of the synonymy of these species has resulted in some amusing errors. Some of these may be enumerated. (1) Mr. Carrington and Mr. Sheldon refer to the dark aberrations of the species which has been for some time known by the name of *biundularia* as *crepuscularia* (*Proc. Sth. Lond. Ent. Soc.*, 1886, p. 156). The same dark form from Derbyshire is referred to by Mr. Sheldon, the following year, as *T. biundularia* (*Ibid.*, 1887, pp. 73 and 87). Mr. W. F. de V. Kane falls into a series of blunders. He says:—"The whole

problem, as stated by your correspondents, is a most complex one, namely, that a pale insect emerging in March and April in the South of England, has a summer form of a warmer tone, while in the same locality a very similar insect, emerging in May to June, assumes the livery of the summer form of the other species, but also has occasional specimens of the pale form." This is "topsyturveydom" with a vengeance. I have no doubt whatever that all the Irish specimens mentioned by him in the same note (*Entom.*, xix., p. 210) are *biundularia*. Then the mixture of synonymy again shows itself (*Ibid.*, p. 254) where Mr. Joseph Chappell calls the early species *T. biundularia*, which he says is taken "on and near larch trees, and is always a dark and distinct species," whilst he reports having taken *T. crepuscularia* in Delamere Forest, and other well-known haunts of *T. biundularia*. Mr. Payne (*Ibid.*, vol. xxviii., p. 171) writes:—" *Tephrosia crepuscularia*. Barrow. Common. *T. biundularia* (= *laricaria*). Frequently, south." Here evidently the author of the Derbyshire list makes a curious mixture in his attempt to unravel Stainton's synonymy. Mr. Nicholas Cooke (*Ibid.*, April, 1887) writes of "*Tephrosia biundularia* appearing in March, and was to be found through April and May," evidently confounding the two species. Mr. Cooke's use of the names is identical with that of Mr. Chappell (in the quotation above), who called the early species *biundularia*. Mr. Kane (*Proc. Sth. Lond. Ent. Soc.*, 1891, p. 55) exhibited specimens of *T. biundularia*, which he said "occurred in May and June, both in the north and in Kerry, and doubted if the earlier brood existed in Ireland." Surely Mr. Kane does not think that our English *crepuscularia* are the parents of our later *biundularia*. If so, it is a great mistake. These must suffice, although it by no means exhausts the list.

There is only one other point to notice. In the *Proc. Sth. Lond. Ent. Soc.*, 1887, p. 39, is a note to the effect that "Mr. Tutt exhibited a long series of *Tephrosia crepuscularia*, Hb., from Hungary, and remarked that he was unable to obtain any forms of *T. biundularia* from that country, although he had received it from Germany." What I did say I cannot, after nearly ten years, recall, but I certainly did not say what I am reported to have said. I now have the specimens of *T. crepuscularia* then exhibited, with the locality label, "Hanover," on them, nor have I ever, to my remembrance, possessed Hungarian examples of *T. crepuscularia*, nor examples of *T. biundularia* from Germany.

In closing this "Historical Sketch" of these insects, based on the data that have appeared in our British magazines during the last twenty years, I have been careful not to trench on ground which is being covered by other lepidopterists, whose united exertions are to appear in the form of a paper to be printed in the *Entom. Record* very shortly. I have, therefore, not dealt with the diagnoses of the larvæ, the microscopic structure of the scales, and other details, which would have swelled this paper to undue proportions, although they would greatly help to elucidate the point under discussion, i.e., as to whether *Tephrosia bistortata* and *T. crepuscularia* are sufficiently distinct in their structure and habits to make it advisable for lepidopterists to consider them as two distinct species.

[A remark made by Mr. Barrett since the above paper was read is

likely to prove misleading. Talking at Mr. Robson (*E.M.M.*, xxxii., p. 267), he asserts that the latter laboured under the disadvantage of not having seen the enormous series exhibited by Mr. Tutt and Mr. Henderson, "in which the arbitrary nature of the separation of the two forms into species seemed to be evident." Apart from the fact that Mr. Robson has stayed with me, and overhauled my collection at leisure, I would point out that, of the thousand or more examples comprising every conceivable form of variation of both species obtainable, exhibited by Messrs. Henderson, Mera and myself, there was not a single specimen that we had the slightest difference of opinion about as to which species it belonged, and it is surely too late in the day to talk about "arbitrary separation" of species in the light of our present knowledge.]

SCIENTIFIC NOTES AND OBSERVATIONS.

HABITS OF THE COCHLIPODID MOTHS. A QUERY.—I know nothing of the habits of the imago of *Heterogenea asella*, except that, when breeding the species, one finds that it copulates at mid-day, and that unless one kills and sets the specimens at once, they fly about the breeding cage in the afternoon, and very soon spoil themselves. The male of *Apoda* (*Limacodes*) *limacodes* (*testudo*), however, flies wildly in the hottest sunshine, in July, above the tall undergrowth in our Kentish woods. The female is lethargic, and is usually obtained when "beating," falling down like a little lump of brown clay to the ground. Barrett says of this species:—"The moth frequents oak woods, and doubtless flies at night. In the daytime it is rather sluggish, sitting in oak trees—young ones especially—among the leaves, and is readily disturbed by jarring the tree, when it usually darts to the ground, and there shams death, but if touched becomes excessively restless" (*Brit. Lep.*, vol. ii., pp. 171–172). Meyrick says the species of this family "fly by night, and are retired in habit." Of course, the insects *may* fly by night, but the general incorrectness of these statements, so far as they relate to the latter species in Kent, leads me to ask for information on this point.—J. W. TUTT.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

APLECTA PRASINA FROM OVUM TO IMAGO IN SEVEN MONTHS.—On June 18th, last year, I boxed a worn specimen of *A. prasina* (*herbida*) on a tree in Jones' Enclosure, Lyndhurst. It laid eggs the same evening, and the young larvæ emerged in about a week's time. They fed at first on dock, later on plantain or dock indifferently. As they developed very rapidly after the beginning of September, I began to think, if the weather continued mild, they might not intend to hybernate at the larval stage. With this idea I introduced lettuce leaves, and tender carrots into the breeding pan, keeping the larvæ cool, but indoors. They now increased in size very rapidly, and at the end of October began to disappear under the cocoanut fibre which lined the bottom of their abode. In the middle of November they were brought into my study, where there was a fire all day, and on December 6th, the first imago issued from the pupa, while many larvæ were still feeding. The last larva disappeared beneath the fibre on Christmas-

day. The insects continued to emerge, till now I have 21 bred. The dates and pauses of emergence are strange: December 6th, one; 9th, three; 10th, one; 11th, one; 12th, one; 24th, one; January 5th, one; 9th, five; others on January 11th, 15th, 17th, 27th, 31st. It will be seen that eight insects had reached perfection before the last of the larvæ had thought of pupation. Most of the emergences took place early in the evening, though one or two issued about 10 a.m. It appeared to me that there was a marked increase in the rate of development after they began to feed on carrots, which they eat with astonishing voracity. The lettuce leaves were equally approved, but I had reason to think were too relaxing a diet. The larvæ were subjected to the disadvantage of no less than three journeys to England and back while feeding, but I have had only one cripple.—(Rev.) FRANK E. LOWE, F.E.S., St. Stephen's Vicarage, Guernsey. Feb., 1897.

LARVÆ OF THE COCHLIPODID MOTHS.—Newman says that the feet (prolegs) of the *Cochliopodid* larvæ “are retractile, so that when one of them is turned on its back, the legs appear to be withdrawn into its stomach; but when again placed in its natural position, the feet are protruded, and take firm hold of the leaf” (*British Moths*, p. 21). Of course this statement, apart from the feet being withdrawn into its “stomach,” is absurd. Chapman describes the real structures that exist, and says, “*Limacodes* has suckers to the first eight abdominal segments, though the first and last of these are poorly developed. These suckers are probably homologous with prolegs, and also with the eight pairs of abdominal legs of *Eriocephala*” (*Trans. Ent. Soc. Lond.*, 1894, p. 345). Poulton (*Ibid.*, 1888, pp. 591–592) gives a most interesting note on the progression of *Limacodes*, and surmises that it has arisen from the larva having sticky ventral surfaces. I wish to ask whether this is not the method now adopted by the larva, as I have just examined some, coiled up in the cocoon, and the ventral surface of the larvæ is so sticky that one can pick them up by means of this adhesive matter, the larva sticking to the flat edge of a knife. Has anyone further information on the point?—J. W. TUTT.

DESCRIPTIONS OF EGGS OF LEPIDOPTERA.—*Polia nigrocincta*.—The eggs are laid in a slightly imbricated manner. They are of the usual Noctuid character, and are very beautiful objects under the microscope. In colour, delicate claret-red. In shape, almost two-thirds of a sphere (somewhat depressed). About thirty longitudinal ribs, broad, glassy and iridescent, closely packed, and uniting in pairs near the summit of the egg (and at the summit a third rib often unites with two others), so that about ten or eleven ribs dip into and cross the micropylar area, and form a central button, of crinoid appearance, in the bottom of the basin-like cavity that this area forms. In the centre of the button the true micropyle is situated. The transverse ribbing is weaker than the longitudinal, yet it is distinct, especially where it crosses the longitudinal ribs. Between the latter, the transverse ribs have the appearance of partly-closed Venetian blinds, when looked at from above. The irregularity of the longitudinal ribbing is very remarkable, and the ladder-like arrangement of the transverse ribs very beautiful. Mr. Murray (to whom I am indebted for the eggs) writes:—“When first laid the eggs are much paler. If fertile, they commence to grow darker in a few days.” [The description was made under a two-thirds lens, on Jan. 15th, 1897].

Cirrhoedia xerampelina.—The egg is of the Noctuid type, attached by the base, and upright. It forms a very flat depressed cone, the width to the height almost 2 : 1. It is of a dark grey colour to the naked eye (probably due to the colour of the embryo within, showing through the transparent shell). Under a two-thirds lens, the egg is glassy-looking, with 24 longitudinal ribs (running from base towards the apex). Normally, these ribs should be alternately long and short, the former running from the base to the summit, the latter stopping short at about one-fourth the distance from the top. Really the longitudinal ribs are rather irregular; in one egg examined there were two short ribs between two successive long ones, whilst in another case the short one was missing. The twelve long ribs run over the edge of the apex into the micropylar depression, and being lightly continued to the centre of the base of the depression, they join in pairs and form there a hexagonal rosette, in the centre of which is the micropyle. The transverse ribs are continuous round the egg, forming distinct knots where they cross the longitudinal ones. The whole system of ribbing has the appearance of an open transverse network, the spaces between the ribs appearing very deep, the surface of the egg not being visible between the ribs. The network is much closer near the apex of the egg. The sloping sides of the micropylar depression form roughly hexagonal cells. The micropyle proper is situated in the centre of the raised button, at the base of the micropylar depression. Mr. Barnes (to whom I am indebted for the eggs) writes:—"The ova of *C. xerampelina* were laid on Aug. 4th, 1896. They have turned from bright or orange-red to the grey colour they now are, in nine days." [The description of the egg was made under a two-thirds lens on Jan. 14th, 1897].

Tiliacea (Xanthia) aurago.—The egg is of the Noctuid type; it forms a depressed cone* (much less depressed than the egg of *C. xerampelina*), its height to breadth being about 2 : 3. Under a 1" lens it is of a delicate purple-red hue, with distinct iridescence, the micropyle appearing as a tiny black button at the apex of the egg. The colour is much paler if held against the light, and the egg looks almost semi-transparent. Under a two-thirds lens, one observes that there are 15 vertical ribs (running from base to apex), each alternate one failing before reaching the summit. The others pass over the summit and unite to form an apical button, on which the micropyle is situated. There is considerable variation in the arrangement of the vertical ribs, one, two, and even three of the shorter ones being sometimes obsolete in an egg. These ribs are broad, and leave but little space between each other. There are about 30 indistinct transverse ribs, which run round the egg in circles, crossing the vertical ribs, where they become conspicuous. There is no well-marked apical depression. This apical structure separates the egg very distinctly from the egg of *C. xerampelina*. To the naked eye the egg looks chocolate-brown in colour, and its resemblance in colour to the scaly bracts of the leaf-buds, upon which the eggs are laid, is very remarkable. [This description was made on Jan. 14th, 1897, from eggs sent by Messrs. Clarke and Barnes, of Reading. Those sent by Mr. Barnes

* Perhaps this type of egg would be better described as "ellipsoid," the lower part of the egg contracting to the base, so that the basal diameter is less than the equatorial diameter.

were laid Sept. 4th, 1896; those sent by Mr. Clarke were laid during the first week of October, 1896].—J. W. TUTT.

VARIATION.

PALE GREY ABERRATIONS OF *BOARMIA ABIETARIA*.—I bred a peculiar pale grey specimen of *B. abietaria* last year, from a larva obtained in the New Forest.—J. C. MOBERLY, M.A., F.E.S., Rockstone Place, Southampton.

VARIATION OF *OPORABIA FILIGRAMMARIA*.—I have bred about a dozen and a half imagines of *O. filigrammaria*, from ova sent me from Bolton, by Mr. Allen. They hatched about the middle of February, fed readily on whitethorn, and began to go down about the middle of April. On August 26th the first emerged, and they continued to do so at intervals until the middle of October. All of them have a slight purplish tinge; but as regards size and markings, they range from large and pale (some large and ample winged, as *O. dilutata*), with the markings hardly more than indicated, to males with dark, clear transverse stripes. I confess I hardly know what *O. autumnaria* is, but a close study of the different books at hand suggests to me that some of the larger specimens of these I have bred might very easily be classified as *O. autumnaria*, if the imago form is all that is to guide one. I found that the larvæ would eat sawallow and birch, as well as whitethorn, which again makes me suspicious as to *O. autumnaria* being a separate species, as very little appears to be known about its larva, beyond that it is said to feed on birch.—J. C. MOBERLY, M.A., F.E.S., Southampton. February, 1897.

NOTES ON COLLECTING, Etc.

ABRAXAS GROSSULARIATA IN THE WINTER.—I have recently bred a specimen of *A. grossulariata* from one of a few full-fed larvæ that I picked up in the garden quite late in the autumn, so late that some of the larvæ died because there were no more leaves to be found on the currant bushes. I still have a few pupæ which are apparently alive. Only a day or two ago I noticed one had somewhat changed colour, and I expected to see the moth emerge, but instead of that I found a dipterous pupa at the bottom of the box, the larva of the Dipteron having eaten its way through the pupa case of the *A. grossulariata*. If the parasite emerges it will find itself a somewhat out-of-date individual.—A. W. MERA. February, 1897.

AUTUMNAL EMERGENCES OF *ACHERONTIA ATROPOS*.—I bred a fine imago of *A. atropos* towards the end of October last, from a pupa sent to me by Mr. J. Anderson, of Chichester.—J. C. MOBERLY, M.A., F.E.S., Southampton.

I bred six fine *Acherontia atropos* during November last. As soon as the nights got cold I began to lose the pupæ, although the imagines were almost matured and ready for emergence. The pupæ appeared to get numbed and feeble. I then put them in a fairly uniform temperature of 80° F., and they here succeeded in emerging again.—E. A. BOWLES, M.A., F.E.S., Myddelton Hall, Waltham Cross.

ABUNDANCE OF *LITHOCOLLETIS* LARVÆ IN THE AUTUMN OF 1896.—The mines of various species of *Lithocolletis* were rather more abundant

than usual last autumn, especially those of *L. sorbi* and *L. emberizae-penella*. As regards the former, the mine is found on the leaflets of mountain ash, and closely resembles that of *L. pomifoliella*. With us the species seems very local, being confined to one small strip of plantation, and only occurring on young trees. There is a good deal of the food-plant in the district; but, up to the present, I have failed to find the mines anywhere except in the plantation.—(Rev.) C. D. ASH, M.A., Skipwith Vicarage, Selby.

NEW FOREST IN 1896.—As a summary of my work in the New Forest last year, I may say that in the spring I found larva-beating pretty productive, although *Asphalia ridens* and *Apatura iris* were scarcer than usual. Of the lichen-feeders, the larvæ of *Lithosia deplana*, *Arentia flecula*, *Cleora lichenaria* and *C. glabraria*, there were plenty, and larvæ of *Boarmia abietaria* and *B. roboraria* were unusually plentiful. Imagines of *Tripharna subsequa* were taken in June as well as September, and *Epimela luteolata* was captured in the latter month. In the autumn there were again plenty of larvæ of *B. roboraria*, *Tephrosia extensaria*, *Eurgymene dolabraria*, and *Gnophria rubricollis*, and those of *Acrionicta leporina* were also fairly abundant. Butterflies were in great numbers everywhere that I collected this summer; but the absence of *Pyrameis cardui* and *Colias edusa*, and the rarity of *Vanessa io* and *Pyrameis atalanta* have been very noticeable.—J. C. MOBERLY, M.A., F.E.S. February, 1897.

BOMBYX QUERCUS TAKING PROBABLY ONLY ONE YEAR TO COMPLETE ITS METAMORPHOSES IN CAITHNESS.—I send you the following observations of mine, as throwing doubt on the generally received idea that *Bombyx quercus* (?) in the North of Scotland, and at high elevations, is always an insect that takes two years to go through its changes. The locality I am dealing with is on the borders of Caithness, and is a wild, bare, cold moorland country, averaging, I should think, 700 feet above the sea level, where I found the insect. From the end of May until the middle of June, I found and examined great quantities of cocoons (about 150 on one occasion in about half an hour). These cocoons were all empty, at least, all with the exception of a very few, which produced, not moths, but ichneumonids—a large black and yellow species—about the middle of June. Two local gamekeepers told me that large brown woolly moths, similar, in their opinion, to *B. rubi*, which I was able to catch and show them, were common on the moors in July and August, and that they had been particularly common the previous year at the beginning of the grouse shooting season (Aug. 12th, and after). Now, as to the larvæ. I wrote in my diary on May 27th, “the heather is covered with them: one sees them at every step; they are from one and a half to two and a half inches long,” and on June 18th, I wrote, “collected a number to take home; most of them will, I think, moult once more.” They all died. Now, it seems to me that these larvæ were far too forward for the *B. callunae*, or two-years’ variety. They were nearly as forward as *quercus* would be in the South of England. And I think they were forward enough to produce imagines that same summer, in July and August, at the time when the keepers said they had seen large woolly moths common on the moors. Certainly that race of *Bombyx* could not have been in the habit of emerging in June, when I believe *callunae*, or the two-year variety, does emerge, for if it had done so, how was it that all the cocoons which I found in May and June were

empty, and that never during my stay there, from May 27th to June 18th, did I see an imago of this insect on the wing, even though the insect was evidently so common in the district? I am only sorry that I never reared any of the larvæ, and that my observations are not therefore conclusive.—W. M. CHRISTY, M.A., F.E.S., Watergate, Emsworth, Hants. Jan. 17th, 1897.

ASTEROSCOPUS SPHINX NUMEROUS IN CO. GALWAY.—When lately on a visit to Clonbrock, co. Galway, I found this moth, which is considered generally scarce on the Continent, according to such authorities as I have been able to refer to, decidedly numerous. As soon as the nights became dark, at the end of October, several specimens were taken nightly in Mr. Dillon's moth-trap, which was placed in a road through a wood. On the 1st November, seven were taken before 11 p.m., and nine after that hour, some of which came flying to my hand lamp, making a total of 16. The next night was very dark and favourable, and twenty-three were captured before midnight, and five more by the moth-trap before morning, making twenty-eight. Two I caught on the wing flying past me; and several more came to the hand lamp. On the 4th there was a pretty sharp frost, but eleven were taken in the trap. On the night of the 5th the thermometer registered 29° F., and no moths of any species flew. After this date, till I left, only small captures were made. It is unnecessary to mention that all these were males. Mr. Dillon and I made careful search on several occasions for females on the tree-trunks, but in vain. They varied in strength of colour somewhat, some having the markings much more pale than the ordinary type. It is interesting also to remark that specimens have been taken by Mr. Dillon in spring as well as autumn, although the ova are deposited (at least, ordinarily) before winter. This habit is noticed by Rogenhofer, according to Hoffmann (*Die Raupen der Schmetterlinge Europas*, p. 123):—"Das Ei überwintert, nach Rogenhofer auch der Schmetterling." The most noticeable thing about the autumnal captures of this season was the utter absence of many of some usual species at ivy blossom or otherwise, such as *Xylina socia*, *Hybernadefoliaria*, etc.—W. F. DE V. KANE, M.A., F.E.S., Drumreask House, Monaghan. Dec., 1896.

CHEROCAMPA NERI IN ABERDEENSHIRE.—A wonderfully good male of the above species was found on September 19th, in one of the out-houses at Grandholm Works, near Aberdeen, by Mr. John Cameron, foreman weaver. Excepting a small portion of the thorax, which is rubbed, it is otherwise in good condition. The specimen was very well set by Mr. John Thomson, a collector who is employed at the works, and who kindly added it to my collection. I enclose a very accurate coloured drawing by Mr. Archd. S. Hill, of this town, it will be seen that the specimen in question has a much greater display of reddish-pink than the figures in Barrett's *Lepidoptera of the British Islands*.—ARTHUR HORNE, 52, Irvine Place, Aberdeen, N.B. November 14th, 1896.

CHARICLEA UMBRA (HELIOTHIS MARGINATA) ABUNDANT IN 1896.—I did very little collecting last summer. The only insect I got commonly was *C. umbra* (*marginata*). It was at one time almost our commonest Noctuid, then it became so rare that it was scarcely seen for years. Last year (1896) it swarmed, and if I could have looked well after it, I could have taken hundreds, as it was I got a very fair number.—J. E. ROBSON, F.E.S., Hartlepool.

EUVANESSA ANTIOPA AT YARMOUTH.—Walking on the south pier at the mouth of Yarmouth harbour, on September, 8th, 1896, my wife, who was with me, called my attention to what seemed to her a curious butterfly, which had just alighted on the pier. I at once started in pursuit, and was pleasurably amazed to see it was *E. antiopa*. I did not attempt to catch it, as I do not see the utility of capturing every rare insect the moment it is espied. As it had the yellow border of the Continental form, I presume it had come across, lodged in the rigging of some ship.—ALBERT H. WATERS, B.A., Cambridge.

ACHERONTIA ATROPOS IN 1896.—This species was not only commoner than usual about Cambridgeshire last year (1896), but I noticed when at Great Yarmouth, at the end of August, that the larvæ were unusually abundant in that part of Norfolk.—ALBERT H. WATERS, B.A., Cambridge.

CARNIVOROUS HABIT OF PODISUS LURIDUS.—On beating a bush of *Viburnum opulus*, I came across *Podisus luridus*, in its larval form, busily engaged in sucking the juices of *Gasterucella viburni*. Struck by the (to me) peculiar fact of a "plant bug" indulging in a carnivorous diet, I took it home and reared it on wasp grub and flies. I found it would attack live insects if they remained fairly quiet, but was terrified by the struggles of a *Tipula*, or any similarly powerful creature. It changed its skin three times while in captivity, the resplendent bronze border of its abdomen and thorax becoming more beautiful with each ecdysis.—W. W. ESAM, Eagle House, St. Leonard's.

ATTRACTIVENESS OF DOGWOOD SAP TO MOTHS.—Last spring I found that the sap exuding from freshly cut dog-wood was of such superior attraction to the usual sallow-loving insects, that the salallows were practically blank, and each stem of cut dogwood was covered with moths. Has this attraction been noticed by others?—W. B. THORNHILL, Castle Cozey, Castle Bellingham, Ireland. Feb., 1897.

PUPA-DIGGING IN IRELAND.—Pupa-digging has been a blank this winter here: certain trees which for several years have yielded me some one hundred and fifty pupæ, have, this winter, yielded six. The trees are ash, sycamore, elm, willow and poplar. Will the coming season be a bad one for the imagines of arboreal feeders? if not, where did the larvæ pupate? They certainly are not in the usual places. I infer that next season will be a good one for all *but* arboreal feeders, as I have several times noticed that when the latter are abundant the former are scarce, and *vice versa*. Has this been noticed before?—IRID.

TEPHROSIA CREPUSCULARIA (BIMDULARIA) IN IRELAND.—I think now that our Irish *Tephrosia* is *T. crepuscularia (bimdularia)*, not *T. bistortata*. I have never met specimens before the 5th (or 6th) of April, and they straggle on to mid June, but are then mostly worn, showing, apparently, that the emergence is spread over some weeks. The insect is most plentiful about mid May, and appears as numerous in the Northern districts as in the warm and humid South.—W. F. DE V. KANE, M.A., F.E.S., Drumreask House, Monaghan.

PHYCIS OBLITELLA.—On looking over a number of knot-horns I purchased at Burney's sale, I found among the *Ithodophaea suavelia* a fine specimen of this species.—J. B. HODGKINSON, F.E.S., Ashton-on-Ribble. [There were so many foreign specimens of many of the rarest British insects in Burney's collection, that one would be rash to suppose that any unlabelled specimen was really British.—ED.]

CATAPLECTICA FARRENI.—A specimen that I could not determine when I captured it, but which I thought was an *Elachista*, corresponds with six specimens of *C. farreni*, sent to me by Mr. Farren.—IBID.

THE LEPIDOPTERA OF CHURCH STRETTON IN 1896.—The season, from May to the end of July, was one of the best which I have ever had in this neighbourhood. Of the productiveness, or otherwise, of the salallows I cannot speak, having been away, and, moreover, laid up with influenza at the time that these were in bloom. Owing to the same cause, a large brood of *Endromis versicolor*, which I had reared, *ab ovo*, were, for the most part, spoiled, and quite unfit for setting. On the 25th April, *Cucullia verbasci*, a species hardly to be expected here, came to light. *Leiocampa dictaeoides* fell to my lot on May 11th; it was a very good year for this species, which continued out till the beginning of June. On the 18th of the former month I got several specimens of *Syrichthys malvae* (*alveolus*), which, as a rule, is not common with us. The first *Nemeophila plantaginis* was noted by me on the 17th of the same month, and a few *ab. hospita* on the 23rd and 26th. This *ab.*, I regret to say, was very much rarer this season than last, a circumstance which I attribute mainly to the very open winter of '95-'96. I was lucky enough to get a very dark form of *Amphidasya betularia* *ab. doubledayaria*, at rest on a large oak, on the 19th May. The following day may be considered a red-lettered one, in so far as *L. dictaeoides* is concerned, for, on that date, I caught two ♂s and two ♀s at rest on birch, though it was one of the very coldest days of our spring. About this time I found a few larvæ of *Lithosia complana* roaming about, apparently in search of snug quarters for pupation. On the 21st, I bred a very beautiful form of *Craniophora ligustri*, which, instead of being more or less green, was suffused with violet, very similar in shade to that found on *Dianthoeia cucubali*. The same evening I took another specimen of the same form, resting on ash. On May 28th, a beautiful ♀ *Cerura bicuspis* emerged from the pupa which I had cut from a birch the preceding August. It is a very large specimen, almost as wide across the wings as my largest ♀ *C. bifida*, and is much darker than any of the same insect got off alder; indeed, the central band on the forewings is almost black! About this period, *Choerocampa porcellus* began to appear pretty freely at honeysuckle and rhododendron bloom; it was joined, during the earlier part of June, by its congener, *C. elpenor*. Now sugar began to pay here; insects turned up as freely as they did in "the seventies." Of this I was very glad, having begun to think, owing to frequent failures, that this form of attraction had lost its charms for lepidoptera. I never remember seeing so many *Triphaena pronuba* before, their forewings being of almost every possible shade, varying from putty-white to almost black. *Leucania comma*, too, was very common; it is a large, well-marked form which we mostly obtain. By this means also I managed to get *Xylophasia lithoxylea*, *Xylophasia rurea* *ab. combusta*, *X. hepatica* and *X. polyodon* *ab. brunnea*, Tutt, and *ab. infuscata*, White, as well as very many common species. Three splendid specimens of *Plusia interrogationis* were taken by me, *viz.*, on the 23rd and 27th of June, and on the 5th of July. Passing on to this latter month, I was greatly surprised, on the 6th, to net a very fresh *Cerigo matura* (*cytherea*) flying in one of the dampest meadows about here, and a good distance

away from any dry stony banks, which this insect seems usually to frequent.* *Thecla w-album* was so passé by the 8th and 10th of that month, that, though I saw a dozen on the former date, and seven on the latter, all either settled on or flying over bramble sprays, I was glad to let them alone, after netting a couple, and discovering the state in which they were. I managed to get a good series of *X. scolopacina* by searching rushes and thistle heads in a damp wood about a mile away, where I further secured a few very good examples of *Noctua stigmatica*, as well as *N. dahlia*. On July 12th and 18th, I captured on the heather, about the summit of the Longmynds, an insect, which I feel much inclined to call *N. conflua*†; it is smaller, and, as a rule, more brilliantly coloured than *N. festiva*, which latter occurs with us usually in damp woods, while the smaller species is restricted to the heather, which in extent covers miles on the top of "the hill." In the same locality I obtained some very good forms of *Dryobota furva*, which appears to be partial to high ground. *Charaas graminis* was very common during the first half of August at the spot where earlier I had got *X. scolopacina*. I managed also to rear these two from caterpillars. I got a few full-fed larvæ of *Choerocampa elpenor* as early as the 21st July; they were very large, and ought to produce splendid imagines. *Agrotis lucerna* again made its appearance in its old habitat; I noticed a few flying on the 14th July. About this time I bred a small number of *Tethia subtusa*, from larvæ found in the spring. I was very much astonished to get *Agrotis obeliscus* here, both at light and sugar, also two examples of *Noctua depuncta*; these two species were taken in August. On 29th August, and on 6th September, I captured ♀s of *Neuronia popularis* for the first time; they were flying around lamps; the ♂ is common here at light most years. From the middle of September to the end of October, eight specimens of the autumnal brood of *N. plantaginis* emerged, one of these, a ♀ bred on the 28th September, has the hind-wings tinged with red, much as the Continental type of this sex. On September 18th, I caught two specimens of *Lithomia solidaginis* at rest, on some large ash-trees in the valley, and one more on the 28th, in a like position. The first few days of October I got a few *Xylina ornithopus*, on these same trees; they were as fresh as if they had been reared. I did not, this year, see a single *Mellinia gilvago* or *Cirrhoedia cerampelina*, though I began looking for the latter early in August. On the other hand, I am glad to say that, on the 7th October, I found a ♀ *Tiliacea (Xanthia) avarago* at rest on a blade of grass; I placed her in a box with a branch of beech, and fortunately she has laid some twenty eggs or so, the larvæ from which I hope to rear next spring. This species is new to the locality. During November, I bred a good series of *Poecilocampa populi*, from larvæ found in June last. They vary very much in size. I have, for some seasons past, reared *Luperina cespitis* from young larvæ, and have always fed them exclusively on meadow-grass (*Poa annua*); the

* This species is very abundant on Wicken Fen, and along the ditch sides at Deal.—ED.

† *Noctua conflua*, Tr., is only known as British from the Shetland and ? Orkney Islands. *N. conflua*, H.-S., is a large form of *N. festiva*. Our correspondent's specimens would appear to be *N. conflua*, Newn., a quite different insect, generally recognised now as a moorland form of *N. festiva*, and with no title of claim at all to the name *conflua* (vide., *Brit. Noct. and their Vars.*, ii., p. 119, and *Ent. Rec.*, vol. vii., p. 77)—ED.

perfect insects, obtained from larvæ thus treated, will compare very favourably as to size with any specimens of this species which I have seen. so that there must be some cause, other than the one suggested, for the dwarfed condition of those bred by Mr. Ficklin (*Ent. Rec.*, viii., p. 279).—F. B. NEWNHAM, M.A., Church Stretton, Salop. Dec., 1896.

NOTES FROM YORKSHIRE, 1896.—I did but little work last year, but whilst at Saltburn during the first fortnight of July, I took *Hadena abjecta*, and, from leaf-mould brought from Sandburn, I bred *Notodonta chaonia*. In the autumn I went over with Mr. Porritt to the home of *Halesus guttatipennis*, and found it literally in thousands.—G. C. DENNIS, F.E.S., 39, Blossom Street, York.

PRactical HINTS.

Field Work for March and April.

By J. W. TUTT, F.E.S.

1.—The larvæ of *Dichrorhampa plumbana* and *D. plumbagana* are to be obtained in March and April by digging up plants of *Chrysanthemum leucanthemum*. The latter tunnels in the centre of the root-stocks, whilst the former occurs deeper down in the roots, grooving them deeply under cover of a web. The larva of *D. plumbana* also mines in stems of yarrow (*Achillea millefolium*).

2.—At the end of March and first week of April, collect the catkins of birch, and tie up tightly in linen bags, or turn them into a band-box with a close fitting lid. *Paedisca bilumana* and other species will be bred.

3.—In March and April the larva of *Paedisca oppressana* feeds within the buds of *Populus nigra*.

4.—In early spring, collect cones of spruce-fir for *Coccye strobiliella*.

5.—Young currant shoots with withering leaves should be collected in April for *Incurvaria capitella*, and young raspberry shoots, showing a similar tendency, should be collected for larvæ of *Lampronia rubiella*.

6.—Stems of wild cabbage, collected in April, showing little heaps of frass sticking out of the new shoots and leaf-stalks, give larvæ of *Stigmonota leplastriana*.

7.—The larva of *Depressaria assimilella* is to be found in united broom-twigs in early April.

8.—Seedheads of *Arctium lappa* should be collected in April for pupæ of *Parasia lappella*. They pupate in the heads, and emerge in July.

9.—The shoots of *Anthyllis* should be examined in April. Their bleached appearance betokens the presence of *Anacamptis anthyllidella*.

10.—During April, beat heather, *Myrica*, cranberry, etc., into an umbrella by night. Larvæ of local NOCTUIDES, GEOMETRIDES, *Coleophora pyrrhalipennella*, *C. juncicolella*, and others, have thus been taken in abundance. It is best to tumble the beatings into a bag, and carefully overhaul them at home.

11.—The larva of *Lampronia praelatella* is to be found under wild strawberry leaves, in April.

12.—The larvæ of *Coccye hyrciniana* are plentiful on spruce firs, and *Coleophora laricella* on larches, about the middle of April.

13.—The second week in April, the central shoots, at the tips of branches of young trees of Scotch fir, should be collected for larvæ of *Retinia turionana*.

14.—In April the males of *Nyssia zonaria* are to be found sitting on the bare twigs of the previous year's dwarf willows, or on tufts of grass on the Wallasey sand-hills.

15.—The sunny side of spruce hedges should be beaten during the first week of April for *Steganoptycha pygmaea*. It can only be disturbed from about 12.30 p.m. to 4.30 p.m. During this period the male flies out if disturbed, but the female drops to the ground.

16.—The full-fed larvæ of *Brephos parthenias* and *B. notha* must have a piece of old cork in which to pupate.

17.—Search the beds of striped grass in gardens for the larvæ of *Apamea ophiogramma*, which feed low in the stems.

CURRENT NOTES.

The last successful exhibition of natural history specimens held by the City of London Entomological and Natural History Society, and the brilliant gathering of entomologists and their friends at the London Institution, will be in the recollection of all our readers. Another exhibition will be held on April 27th, which bids fair to more than rival the success of the last. It will be held at the London Institution, on the evening of April 27th, and will be opened by the Rt. Hon. Lord Walsingham, M.A., F.R.S., etc., who is one of the hon. members of the society. Tickets may be obtained from Mr. H. A. Sauzé, 4, Mount Villas, Sydenham Hill Road, S.E. As the committee wish to prevent any possibility of crushing, and the number of tickets issued will be limited, early application should be made for them.

The South London Entomological Society owes much to its leading members. Mr. Stanley Edwards, who a short time ago placed the society very much under obligation by the presentation of a magnificent lantern, has now presented them with a large screen for use with the lantern.

SOCIETIES.

CITY OF LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.—Feb. 2nd, 1897.—LARVÆ OF *BOMBYX* (*LASIOCAMPA*) *QUERCUS* AND *B. SPARTII*.—Mr. Bacot exhibited larvæ of *Bombyx spartii* and *B. quercus* from ova laid by parents (received from Mr. Warburg) from S. France, and larvæ of English *quercus* (received from Mr. Goymour). Also blown larvæ of *Bombyx rubi*, *B. trifolii*, *Clisiocampa castrensis*, for comparison. He said that the difference between *spartii* and the French *quercus* was quite apparent after the 2nd moult, but was more marked after the 3rd. It consisted in the different colour of the dorsal coat of short hairs or fur. This, in *spartii*, was light red-brown, while in the *quercus* it was white. The larvæ of the English *quercus* differed markedly from both S. of France forms in the 4th or 5th skins. They seemed to be quite a moult behind the French races in getting their adult skins. The head was dark blue or blue-black, while in the French species it was usually reddish-brown, with a white marking on the face, that was generally absent in the English form, although a few of these larvæ had a dirty white marking on the face, which, however, differed in shape from that on the French larvæ. The hairs were also much more scanty in the English form, and the long hairs, which in

the French races were white, were brown in the English larvæ. The white sub-dorsal line, and the remnants of the oblique stripes, were also stronger in the English forms, and there were traces in some larvæ, strongly developed, of a blue line or band just above the sub-dorsal line, probably a remnant of the blue stripes that are well developed in *B. trifolii* and *Clisiocampa neustria*, and slightly less so in *C. castrensis*. The English *quercus*, Mr. Bacot took to be the older form, the French *quercus* occasionally having faint traces of the blue, coming between it and *spartii*, which was more constant, and tended to approach *B. rubi* in the loss of these markings. Mr. Warburg had also very kindly given Mr. Bacot a few larvæ, the result of a pairing between a ♂ *quercus* (French) and a ♀ *spartii*. The larvæ were now in about the 4th stage; 4 of them had the white *quercus* coat, 6 the red coloured fur of *spartii*. ON A FIXED HYBERNATING STAGE IN LARVÆ OF ORGYIA GONOSTIGMA.—Mr. Bacot said that he had placed some larvæ of *Orgyia gonostigma*, which had passed the usual hybernating stage before the food supply failed, in a cold room, to see if they would hybernate. They attempted to do so, fastening themselves in one position, which they occupied through October, November, and most of December. But they had subsequently died, being unable apparently to stand the recent cold, which had had no ill effects on larvæ hybernating in their normal stage. EUROPEAN AND AMERICAN CATOCALIDS.—Mr. Dadd exhibited *Catocala fraxini* from Germany, *C. nupta* from Wood Green, *C. sponsa* and *C. promissa* from the New Forest, and *C. pacta*, *C. luciana* and *C. concumbens* from Dakota, U.S.A. HYBRID ZYGÆNIDÆ.—Mr. Tutt then exhibited some hybrid ZYGÆNIDÆ, and read the following notes:—"It is in the memory of you all that Mr. W. H. B. Fletcher has bred hybrids between *Z. lonicerae* and *Z. filipendulae*, and between *Z. lonicerae* and *Z. trifolii* (the progeny of the latter proving fertile for four generations). In my pamphlet, 'Notes on the Zygænidæ,' I described fully two very distinct Zygænidæ, which had been united by Staudinger under the name of *Z. trifolii* var. *dubia*. These were *Zygæna medicaginis*, and *Z. ochsenheimeri*, Zell., the former a five-spotted species, closely related to, but larger than *Z. lonicerae*, the latter a six-spotted species, closely allied to *Z. filipendulae*, aberrations of which have been erroneously referred to this species. Whilst we were at Courmayeur (Piedmont), in 1894, Dr. Chapman sent eggs of *Z. ochsenheimeri* to Mr. W. H. B. Fletcher. These duly hatched, and when the imagines emerged a ♀ *ochsenheimeri* was paired with a ♂ *filipendulae* from the Sussex Downs (Lewes or Shoreham). Eggs were obtained, and a part of the moths resulting by the cross I now exhibit. Mr. Fletcher adds that the hybrids (or mongrels) paired *inter se*, and the larvæ duly hatched. You will observe that the true *Z. ochsenheimeri* shows considerable sexual dimorphism, the male being smaller than the female, the sixth spot (or lower of the outer pair of spots) being almost obsolete, with a distinct concavity on the outer margin of the hind-wing, which is largely accentuated by the widening of the rather broad black margin at this area. The females show the same peculiarities, but less markedly than the males. You will also notice that the males of the cross exhibit very markedly the characters of the male of *ochsenheimeri*, the sixth spot, in all but two of the male specimens, being much reduced, and in a majority of the specimens the hind-wing is like that of *ochsenheimeri*. On the other hand, the females, with two exceptions,

are strikingly *filipendulae*, and the hind-wing character is almost entirely lost." INSECTS FROM THE CHESHIRE COAST, BIDSTON, ETC.—Mr. Tutt exhibited some Lepidoptera from the Cheshire coast, Bidston, etc., and said:—"The insects, which I exhibit for Mr. H. B. Prince, were captured on Wallasey sand-hills. The following particulars about the specimens may be interesting: *NYSSIA ZONARIA*.—These insects are remarkably uniform at first sight, and yet, when carefully examined, exhibit considerable variation. In some specimens the darker areas of the wings are but faintly developed, and the specimens have a very pallid and unicolorous appearance. At the opposite extreme, the transverse basal line is continued up to the costa, and the space between this and the next transverse line is filled in with dark gray shading, forming a more or less distinct transverse band. In other specimens the basal transverse line is almost, or quite, obsolete, and leaves the whole area, from the discoidal lunule to the base of the wing, with only the two dark longitudinal neuronal markings. On the hind-wings there is an equal range of variation, the paler having scarcely any trace of the three transverse bands, which are very distinctly marked in the darkest specimens. The apterous females show no marked variation. *Triphaena orbona* (*comes*).—A moderately variable series, with nothing approaching the range of variation found among the Scotch specimens. Of the colour aberrations, you will observe the ab. *adsequa*, Tr. (pale grey), ab. *grisea*, Tutt (dark grey), ab. *ochrea*, Tutt (pale ochreous), and ab. *rufo-ochrea* (pale ochreous, tinted with red). For descriptions of these forms *vide* *Brit. Noctuae and their Varieties*, vol. ii., pp. 96-99. At the same time it will be observed that two or three specimens closely approach the ab. *connuba*, Hb., and the ab. *subsequa*, Haw. This is probably the usual range reached in our Southern and Midland English counties. *Noctua xanthographa*.—Among these we get the usual range of variation, extending from the pale grey ab. *cohaesa* of Herrich-Schäffer, the typical *xanthographa*, Fab., the pale reddish-grey ab. *rufescens*, and an approach to ab. *obscura*, without reaching the range to which the Scotch specimens often reach. *Triphaena pronuba*.—The range in this series comprises some of the more usual forms. There is the pale grey type, the ab. *ochrea*, Tutt (greyish-ochreous form), the ab. *brunnea*, Tutt, and the ab. *ochrea-brunnea*, Tutt. Altogether the series tends to the darker aberrations. *Mellinia circellaris*.—The series of this species is composed of about half each of the greyish-ochreous type (*circellaris*), and the redder ab. *ferruginea* of Esper. The suffused ab. *macilenta*, Hb., is not represented. *Orthosia lota*.—These are a most uniform series of the insect. Of the thirteen insects 11 are quite of the typical coloration, whilst one shows a tendency to approach the ab. *rufa*, Tutt. *Apamea basilinea*.—The four specimens sent are very fairly typical. *Ematurga atomaria*.—These specimens were captured on Thurston Common, by the river Dee, in May, 1896. They are rather smaller than our southern form, and more nearly approach in size, and in their dark fuscous coloration, those from the northern moors. *Hypsipetes ruberata*.—Captured at Flaybruck Hill, near Bidston, in May, 1896. These are an interesting series, somewhat smaller than the Wisbech specimens. Most of the individuals show the transverse markings fairly well, whilst only two examples exhibit the pale central band so conspicuous in the two allied species—*trifasciata* and *furcata* (*sordidata*).

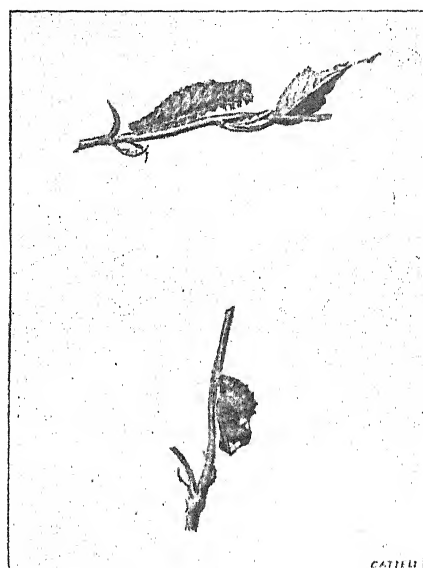
ENTOMOLOGICAL SOCIETY OF LONDON.—February 3rd, 1897.—
 TYROLEAN AND PORTUGUESE COLEOPTERA.—Mr. Champion exhibited an extensive series of Coleoptera, collected by Mr. R. W. Lloyd and himself in July last in the Austrian Tyrol, and containing about 450 species, including 35 of Longicornia and about 20 of Otiorrhynchus. He also exhibited about 85 species of Coleoptera from Cintra, Portugal, collected by Col. Yerbury, the most interesting of these being *Carabus lusitanicus*. ZEUGOPHORA FLAVICOLLIS AT COLCHESTER.—Mr. Champion exhibited, on behalf of Mr. W. H. Harwood, two specimens of the rare *Zeugophora flavicollis*, Marsh., from Colchester. MICRO-LEPIDOPTERA FROM LANCASHIRE.—Mr. Tutt exhibited, for Mr. J. B. Hodgkinson, a number of obscure British Micro-lepidoptera, many of which had been regarded as new species. The validity of the determinations was questioned by Lord Walsingham, Mr. B. A. Bower and others, and the first-named speaker strongly deprecated the practice of positively recognising or describing such obscure forms, particularly when British, from single or worn specimens. A suffused aberration of a *Gelechia*, taken at Witherslack, and described under the name of *Lita intermediella* (Ent. Rec., ix., p. 36), was referred to *Lita fraternella*. PLATYPTILIA TESSE-
 RADACTYLA IN IRELAND.—Mr. Barrett showed specimens of the true *Platyptilia tesseradactyla*, L. (= *P. fischeri*, Zell.) new to the United Kingdom, and taken in co. Galway by Mr. W. F. de V. Kane and the Hon. R. E. Dillon. The species was widely distributed in N. and Central Europe, often occurring at a considerable elevation, and was said to feed on *Gnaphalium*. Mr. Tutt stated that he had found *P. fischeri* to be common in the Alps among *Petasitis*; and Lord Walsingham spoke in support of the identification. LOCUSTS AS AN ARTICLE OF FOOD.—Mr. McLachlan exhibited cooked locusts (*Schistocerca peregrina*) received from the Rev. A. E. Eaton, and sold in the market of Biskra, Algeria. They were cooked whole, but the abdomen only was eaten. SEASONAL DIMORPHISM IN AFRICAN BUTTERFLIES.—A paper on this subject was communicated by Dr. A. G. Butler, who contested the views of Mr. Guy A. K. Marshall (Tr. Ent. Soc. Lond., 1896, pp. 551—566) as to the distinctness of certain forms of *Acræa*, and maintained that one part of Africa cannot and does not represent the entire range of a species, with its extreme dry and wet-season forms, and that the dry season form of a moist district may be the intermediate or a wet season form of a drier district. The author also stated that the black apical patch of the fore-wings in *Acræa* was not of specific value, inasmuch as all grades existed between the broadest apical patch and no patch at all; it was probably only a seasonal development or a mere variation. Many of the species recognised as distinct by Mr. Marshall were merely varietal, and were linked together by intermediate forms in the collection of the British Museum. Such were *Acræa pulorina*, Stand., *A. acrita*, var., Trim., *A. acrita*, Hew., and *A. chaeribula*, Oberth. Mr. Trimen upheld Mr. Marshall's conclusions. A long discussion followed, chiefly on the so-called "dry season" and "wet-season forms." Mr. Merrifield stated that he had been unable experimentally to modify the colour and markings of Lepidoptera by variations in humidity. Mr. Tutt said that it was recorded that Mr. Doherty had obtained "wet-season forms" of *Melanitis leda* by keeping the larvæ, that should normally have produced the "dry-season" form, in a moist atmosphere.

SOUTH LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.—

Feb. 11th, 1897.—*DIANTHÆCIA CONSPERSA* AB. *OCHREA*.—Mr. Routledge exhibited a fine ab. *ochrea* of *D. conspersa*, bred from pupæ received from the Orkney Islands. The ground-colour was of an ochreous tint, the usually white markings being grey. LARVÆ OF *HEPIALUS LUPULINUS*.—Mr. Tutt exhibited two living and several dead larvæ of *Hepialus lupulinus*, dug up on Feb. 10th, by Mr. E. A. Bowles, at Waltham Cross, at the root of a *Poëonia officinalis*, within an area of one square foot. The dead larvæ had been attacked by a fungus, and were quite rigid with the vegetable growth which had completely replaced the internal organs and tissues of the larva. LIVING LARVÆ OF *BRYOPHILA PERLA*.—Mr. Tutt also exhibited living larvæ of *B. perla*, found by Dr. Chapman, at Hereford, on Feb. 10th, *in situ*, on a small piece of the fungus-covered stone on which they were found. The larva lives during the winter in a little close nest or cocoon, each solitarily, and does not feed in the winter, but had evidently already begun to do so when taken. The larvæ appeared to be in the penultimate skin. *APLECTA OCCULTA* BRED IN WINTER.—Mr. McArthur exhibited a specimen of *Aplecta occulta* bred on the day of the meeting (Feb. 11th), from a Rannock larva. Mr. Adkin exhibited a long series of imagines of the same species, recently bred from larvæ taken in the same locality. PHOTO-MICROGRAPHY.—Mr. F. Clark, assisted by Mr. Furneaux, then exhibited some 60 photo-micrographic slides of insect anatomy, with the aid of the lantern. The slides were most interesting and instructive, those exhibiting the differences between the antennæ of *Hybernia aurantiaria* and *H. defoliaria*, the tongues of various insects, the androconia of the Lycænids, etc., being much admired.

REVIEWS AND NOTICES OF BOOKS.

DIE DEUTSCHEN PTEROPHORINEN.—[With three plates, pp. 194, Regensburg, 1894-95, by Dr. Ottmar Hofmann].—The object of the present notice is to call attention briefly to a paper which is the most important contribution to our knowledge of the Plume moths yet published in Germany. The author, it is believed correctly, regards Plume moths as a separate family from the *Pyratidae*. Dr. Hofmann divides the species under 13 genera, and gives a careful description of all the stages, with new and interesting anatomical details. Particularly valuable are the observations on the pupa, and the embryonic condition of the veins in the pupal wing. It is probable that the generic groups founded by Dr. Hofmann are of sub-family value. Among the English species identified by Dr. Hofmann on the Continent, is *Oxyptilus heterodactylus* (*teuerii*, Green.), with its variety, *celusii*, Schmid. Analytical tables for the determination of both genera and species are given, and the figures on the three plates are finely executed. The limits of the present notice will not allow of further detail, but the careful work in the separation of the genera may be briefly commended. Dr. Hofmann shows that *Oedematophorus* is a good genus, differing from *Leioptilus* by the scale patches on the middle tibiæ, the neurulation, and in that segments 2-3 of the abdomen are comparatively more elongate than in *Leioptilus*. In view of the uncalled for suppression of natural genera, which is occasionally noticeable in the works of recent writers, Dr. Hofmann's careful study is most grateful reading.—A. RADCLIFFE GROTE, Roemer Museum, Hildesheim.



LARVA AND PUPA OF THECLA PRUNI.

The Entomologist's Record

AND

JOURNAL OF VARIATION.

VOL. IX. No. 4.

APRIL 15TH, 1897.

Contributions to the life-history of *Thecla pruni*.

(Illustrated by Plate).

By J. W. TUTT, F.E.S.

I.—THE FULL-FED LARVA OF *THECLA PRUNI*.—The larva of *Thecla pruni*, in its last skin, is of a lovely delicate green, with a tinge of yellow in it, especially laterally, the sides ending below in a pale tumid sub-spiracular ridge. It is well supplied with short brown hairs. The ventral surface is much paler, *i.e.*, is of a whitish-green, rather than yellowish-green; it is also very glassy, and the skin is more sparingly sprinkled with pale glassy-looking hairs.

HEAD.—The head is very small, of a very pale whitish-brown hue, the mouth-parts darker brown; the ocelli are transparent, placed on two black lunules, one on each cheek, five ocelli being arranged in an arc on the side nearest the mouth, a sixth being separate, and placed by itself on the side of the cheek remote from the mouth.

The head is sprinkled with a number of glassy-looking hairs. It is quite retractile within the prothoracic segment, but is extended to some distance beyond the pro-thorax when the larva is attempting to find a crossing from one leaf to another.

THORAX.—The front edge of the pro-thorax is also studded with glassy-looking hairs, similar to those on the head, but further back (dorsally) the pro-thorax becomes covered with short, black, curved bristles. The segment itself is very extensible, and stretches considerably when the larva is actively moving. The true legs are very pale and glassy, well-sprinkled with long glassy hairs, and terminated with a dark brown retractile hook. The meso-thorax and meta-thorax are flattened dorsally, although the segmental incisions are very deep, and there is a gradual rise from the head to the second abdominal segment.

ABDOMEN.—The 2nd, 3rd, 4th, 5th and 6th abdominal segments bear a double ridge of raised dorsal serrations, the raised points decreasing in size on the 5th and 6th abdominal segments. These are distinctly separated by the deep segmental incisions, and by the fact that they do not extend so far forward as the 1st sub-segment of each segment. The apices of these raised projections are edged with purplish-red internally, and yellowish externally, and are well supplied with purplish-red hairs. The spiracles (on the 1st, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th abdominal segments) are very minute, scarcely to be detected by the naked eye, but, under a one-sixth lens

each shows as a dull orange-coloured cup-shaped hollow, with a darker (brownish) rim. Just above the spiracles, a sub-spiracular line is to be traced slightly paler than the ground-colour. Under a high power (one-sixth) this line is found to be studded with minute glandular-looking warts, probably the traces of supra-spiracular tubercles, a few similar warts occupy the position of the pre-spiracular tubercles, but they are all quite smooth, and bear no hairs, although the skin is plentifully supplied, both laterally and dorsally, with short brown hairs. These are particularly abundant on the hinder abdominal segments, and on the posterior edge of the anal segment the black hairs are much longer than elsewhere, and form a dense fringe, which is even visible to the naked eye.

MODE OF WALKING, PROLEGS, ETC.—The slow gliding motion of the larva is very remarkable. The anal prolegs are pushed forward as far as possible; and this forward movement is followed by each pair of prolegs in turn, and then by the true legs, so that a wave seems to run from segment to segment along the body. When at rest, the legs are retracted, and the larva rests almost flat upon the surface of a leaf. When in motion, the anal segment is slightly raised. The prolegs are retractile, exceedingly pale, and terminated by a broad flange covered with short, and apparently weak, pale brownish hooks. The joints of the prolegs are supplied with long pale glassy-looking hairs, like the true legs. The movements of the larva give some variation to its tint, for, whilst the larva at rest is very uniformly green, in motion there is a distinctly darker green medio-dorsal line traceable from the head to the anus, making the central furrow look darker than the ground-colour, but this darkening is largely due to the food in the alimentary canal.

This description was taken on the morning of May 30th. The larva assumed the quiescent form during the evening of the same day, and by the following day had spun a silken pad and girth, and was ready for pupation.

II.—LARVA OF *THECLA PRUNI* IN THE QUIESCENT STAGE PRECEDING PUPATION.—On May 26th, I received from Mr. H. Mousley a larva of *Thecla pruni* which had already attached itself to a leaf of blackthorn by a white silken anal pad and slender white girth, that passed round the centre of the post-thoracic segment. The head was quite retracted, and the dorsum had assumed an arched appearance, although the venter was closely appressed to the leaf to which it was fastened. The larva in this position gradually increases in height and width from the pro-thorax to the 3rd abdominal segment, and then narrows again to the anal segment. The 2nd, 3rd, 4th, 5th and 6th abdominal segments bear a double longitudinal serrated ridge, in the form of a series of raised points on either side of the medio-dorsal area, which forms a furrow between the two ridges. This furrow narrows posteriorly, and ends in a point on the anal segment. The absence of the ridge on the thoracic and first abdominal segments makes the dorsum slope rapidly from the 1st abdominal segment to the head.

The colour of the larva at this stage is yellowish-green, the apices of the ridge-points purplish-red, externally edged with yellowish, the central furrow rather darker green than the ground-colour. The skin is thickly sprinkled with short black bristles, these are mixed with longer brownish hairs on the thoracic segments, with longer white hairs

along the sides, and purplish hairs on the dorsal ridges. The segmental incisions are deeply cut, causing the segmental sections of the ridges to appear to be pointed backwards.

THORAX.—The *pro-thorax* is narrow, but protuberant, and covers the retracted head. It is thickly covered with long pale brown hairs. The pro-thoracic spiracles are placed low down, one on each side, just in front of the segmental incision that separates the pro-thorax from the meso-thorax. The *meso-thorax* is wider than the pro-thorax, extends back considerably, and is somewhat protuberant, the two transverse sub-segmental divisions apparent on the dorsum, and suggesting the meso-thorax of the pupa. The *meta-thorax* is wider transversely, but very narrow from front to back. It is round the centre of this segment that the silken girth is placed at this stage, although it slips back to the 1st abdominal when pupation takes place.

ABDOMEN.—*Dorsally.*—The 1st abdominal segment is narrow from front to back, and without any special armature. (It may be readily distinguished, however, by its conspicuous spiracle). The 2nd, 3rd, 4th, 5th and 6th abdominal segments have a raised ridge on each side of the medio-dorsal area. These are broken up by the segmental incisions, and, owing to the stretched condition of the larva in this stage, it is seen that the portions of the ridge do not extend to the anterior sub-segment of the segments on which they are placed. This suggests, also, that the backward direction which each portion of the ridge takes has been brought about to make it appear as complete as possible, when the larva is crawling, whilst the absence of the ridge on each anterior sub-segment gives freedom of movement to the larva. The upper edges of the ridges are of a purplish-red colour, edged with pale yellowish externally, the purplish portions being well-supplied with purplish coloured hairs, the yellowish portion with pale hairs. Although the ridges practically end with the 6th abdominal segment, the median furrow is theoretically extended to the anal segment, where the ridge crops up again as a raised median, purplish-red, dorsal, terminal point. The furrow is but very little darker than the ground-colour. The anal segment bears some general resemblance to the pro-thoracic segment in its flat, lip-shaped appearance.

Laterally.—The sides of the caterpillar are separated from the venter by a slightly tumid longitudinal marginal ridge, well supplied with long whitish hairs, whilst above this, and parallel with it, is a pale, sharply defined, longitudinal sub-spiracular line, which extends the whole length of the body. The segmental incisions are well defined and pale, and the points, where the segmental incisions cut the sub-spiracular lines, are very prominent. The dull orange tubercles are very conspicuous, and placed very high on the sides, about half-way between the lateral (sub-spiracular) line and the dorsal ridge.

The larva changed to a pupa during the night of May 27th.

III.—PUPA OF THECLA PRUNI.—The pupa of *Thecla pruni* is, in its dorsal aspect, more like a bird-dropping than any pupa I have before observed. The general colour of the pupa is black, with a whitish patch on each side of the anteriorly protuberant pro-thorax, another on the lower central area of the swollen meso-thorax, and a third, somewhat)—(shaped, crossing the constricted meta-thorax transversely, and terminated by the wings. Two other narrow lateral

whitish patches run along, one on each side of the abdomen, below the spiracles. These white patches produce a marked effect on the black ground-colour, and there can be no doubt that the pattern of coloration is protective. The skin is somewhat wrinkled and thickly covered with short golden bristles, except on the wing-, leg-, antenna- and maxilla-cases. These are smoother, of a greenish-black hue, and somewhat translucent.

DORSAL VIEW.—The *head* is placed ventrally, the *pro-thorax* rounded, bulging somewhat anteriorly; the *meso-thorax* is large and swollen, the central area bulging, and rounded, and not medially ridged. The *meta-thorax* is narrow, and (with the 1st abdominal segment) constricted to form a very marked waist. The *abdominal segments* gradually increase in size from the 1st to the third, and then decrease to the anal segment. The first abdominal is more constricted than the meta-thoracic segment, and the girth passes over this segment. The 2nd and 3rd abdominal segments, however, bulge out rapidly, whilst the 2nd, 3rd, 4th, 5th and 6th segments bear a double row of dorsal prominences, corresponding with the segmental sections of the dorsal ridges of the larva. Of these the prominences on the 3rd, 4th and 5th are most conspicuous, those on the 6th the least so.

LATERAL VIEW.—The pro-thoracic spiracle is very inconspicuous, black in colour, and placed in the black ground-colour which forms the segmental incision between the pro-thorax and meso-thorax. The wings are dull blackish-green, somewhat translucent, the outer and inner margins sunk in the abdominal segments, which form raised ridges around the wing edges. The spiracles on the 1st, 2nd, 3rd, 4th, 5th, 6th and 7th abdominal segments are small, prominently situated, though not conspicuous, placed high up on the sides of the pupa, upon little elevations, below which is a row of small pointed sub-spiracular points, forming a sort of lateral ridge on either side, on the abdominal segments 2-7. Each spiracle has a dead black rim, surrounded by a shiny black cincture. Along the lateral edge of the abdominal segments 2-8, small whitish patches form a broken lateral line along the ridge.

VENTRAL VIEW.—The mouth-parts and glazed eye are ventral, greenish-black in tint, the glazed eye edged with shiny black, and extending from the base of the 1st pair of legs to the antennae, which edge the pro-thorax laterally, and are then rapidly brought round into the medio-ventral line of the body, ending with the apices of the wings on the 5th abdominal segment. About half-way down the wings the antennae hide the maxillae which pass beneath them, and are not seen again. The joints of the two pairs of legs (which lie between the antennae and the base of the maxillae), and the joints of the antennae are not very distinctly marked. The colour of the wings ventrally is somewhat lighter, but still greenish-black. The ventral area of the 6th and following abdominal segments is much restricted, and the skin is folded into deep corrugations. The genital organs are, however, conspicuous.

The pupa is attached by a cremastral pad, and by a white silken girth. It does not get rid of the cast larval skin.

I am indebted to Mr. H. Mousley for the loan of the original drawing (made by Mr. W. Pearce) from which the block for Plate II. has been made.

The Coleoptera of a London granary.

By HORACE DONISTHORPE, F.Z.S., F.E.S.

Having visited a London granary for the purpose of obtaining Coleoptera for the last nine years, and having for some time past noticed that I could find nothing fresh, I conclude that I have obtained all the species there are to be got from it, and I thought it might prove of interest to publish a complete list, with a brief account of my *modus operandi*.

It will be seen that I have obtained no less than fifty-nine species, some of which are very rare, and others can only be found in such places. One or two are, no doubt, of accidental occurrence, being introduced in hay, etc., but the majority are thoroughly established, turning up year after year.

The means I employed to find the beetles were:—Searching in the cellars in dark corners, and under old sacks, and round the edges of the walls where they were damp; looking regularly on all the windows whenever I called; sifting old flour, grain, etc.; searching in the lofts on the beams and walls; and always taking away a little bagful of siftings to be carefully gone through at home.

There were, kept in one of the cellars, unpleasant-looking blocks of stuff called “graves,” which consist of kitchen refuse boiled down and pressed into cakes. In these I found the two species of *Dermestes* and *Necrobia*. There was also a stock of old biscuits, in which *Trogosita mauritanica* and *Anobium paniceum* abounded. Of other species worth mentioning—*Sphodrus leucophthalmus*, a very large black fellow, which is only found in cellars, and is widely distributed, but decidedly rare in Great Britain, occurs here regularly, as I obtain a few specimens every year, and have been able to supply many of my friends with it. *Dendrophilus punctatus* and *Gnathoneus punctulatus* were found together running on the bottom, and hiding in the chinks of a damp cellar wall, the former in some numbers.

Mycetophagus quadriguttatus is one of the rarest of the *Mycetophagi*. I generally found it in the bags of refuse. *Blaps similis* only occurred in one cellar, and was found very sparingly, but *Blaps mucronata*, the common species, swarmed in all the cellars.

Rye, in his *British Beetles*, says that mealworms from the East-end of London usually produce *Tenebrio obscurus*, and those from the West-end *Tenebrio molitor*. I found both species in this granary, and also reared them from the larvæ.

I was also fortunate enough to take the little *Latheticus oryzae*, Mr. Waterhouse's species.

The following is a complete list of the species taken:—

Sphodrus leucophthalmus, L., *Pristonychus terricola*, Hbst., *Calathus cisteloides*, Pz., *Amara acuminata*, Pk., *Harpalus ruficornis*, F., *Quedius fulgidus*, Gr., *Q. fuliginosus*, Gr., *Creophilus maxillosus*, L., *Omalius deplanatus*, Gyll., *O. concinnum*, Marsh., *Dendrophilus punctatus*, Hbst., *Gnathoneus punctulatus*, Th., *Trogosita mauritanica*, L., *Laemophilus ferrugineus*, Steph., *L. pusillus*, Sch., *Silvanus surinamensis*, L., *Cryptophagus saginatus*, Sturm., *C. badius*, Sturm., *C. affinis*, Sturm., *C. cellaris*, Scop., *Lathridius ruficollis*, Marsh., *I. minutus*, L., *Corticaria fulva*, Com., *Mycetophagus quadriguttatus*, Müll., *Mycetæa hirta*, Marsh., *Dermestes vulpinus*, F., *D. lardarius*, L., *Attagenus pello*, L., *Megatoma*

undata, L., *Anthrenus varius*, F., *Anthocomus fasciatus*, L., *Necrobia ruficollis*, F., *N. rufipes*, F., *Ptinus fur*, L., *Niptus hololeucus*, Fald., *N. crenatus*, F., *Mezium affine*, Boield., *Anobium domesticum*, Four., *A. paniceum*, L., *Rhizophtha pusilla*, F., *Blaps mucronata*, Latr., *B. similis*, Latr., *Tribolium ferrugineum*, F., *Gnathocerus cornutus*, F., *Hypophloeus depressus*, F., *Alphitobius piceus*, Ol., *Tenebrio obscurus*, F., *T. molitor*, L., *Anthicus floralis*, L., *Latheticus oryzae*, Wat., *Calandra granaria*, L., *C. oryzae*, L., *Phloeophagus aeneopiceus*, Boh., *Bruchus pisi*, L., *B. rufimanus*, Boh., *B. sp. (?)*, *Chrysomela graminis*, L., *C. fastuosa*, L., *Cassida viridis*, L.

On the wing-scales and their pigment in Lepidoptera.

[NOTES ON MR. MAYER'S PAPER.]

By T. A. CHAPMAN, M.D., F.E.S.

I daresay attention will be called in the *Record* to a very able and laborious paper by Mr. Alfred Goldsborough Mayer, on the "Development of the wing scales and their pigment in butterflies and moths," printed last June, for the Museum of Comparative Zoology, at Harvard College, Cambridge, Mass., U.S.A., so that there will be no necessity for me to point out the nature of the research, and the general conclusions arrived at by Mr. Mayer. Having gone over a great deal of the same ground several years ago, in investigating the wing development during the pupal stage, with a view to satisfy myself as to the real nature and meaning of "Poulton's line," I am well able to appreciate the value of Mr. Mayer's work, and the general accuracy of his determinations. I may say, in parenthesis, that the questions I had raised for myself as to Poulton's line, were by no means solved, and require further researches than I have yet been able to make.

There is only one point in Mr. Mayer's observations in which I feel unable to agree with him, and therefore desire to call attention to, in order that further observations may be made. It is very possible that Mr. Mayer is correct, and that I am in error, but so many pupal wings of the Vanessids, including several of *P. atalanta*, which gives most facility for the observation in question, were examined by me at all stages, that, were Mr. Mayer's conclusions correct, I can hardly believe the matter would have appeared to me in such a different aspect.

Mr. Mayer says (p. 200): "The protoplasm continues its retraction, until finally it is entirely withdrawn from the scales, and they become merely little flattened hollow chitinous sacs containing only air. The scales are now completely formed, but they still lack the pigment, this being introduced later. Owing to the fact that they are hollow, and contain only air, they diffract the light, and therefore appear pure white, so that the whole wing is now in the 'white stage.'" Again (p. 223): "Those scales, which are destined to be white upon the mature wing, are now completely formed, and undergo no further changes. Hence, ontogenetically speaking, the white spots upon the wings are the oldest of all. Those scales, which are destined to be pigmented, have, however, a different fate; for the "blood," or hæmolymp of the chrysalis, enters them, and they become completely filled with the fluid."

My observations teach me that no air enters the permanently white scales, or any others, until the pigment is fully elaborated, and that air enters all the scales, pigmented as well as white, for the first time, and finally, as the last stage in the development of the scales, not very long before, and possibly often not till after, the emergence of the imago from the pupa. I examined the wings in the fresh state, without staining or preparation, so that, whilst missing much of the histology that Mr. Mayer demonstrates, I probably had a more correct view in this particular matter of the air; at no early stage whatever was there such a change in the specific gravity of the wing as the presence of air in the scales would cause, a change that, many of my manipulations being carried out under water, would have made very unmistakably apparent.

In the second place, in the "white stage," there was never any of that opaque chalky whiteness that is characteristic of the air-filled white scales of *P. atalanta*. Thirdly, the white scales of *P. atalanta* (and others) were clearly full of fluid up to the date of the complete pigmentation of the other scales, and were difficult to see, instead of white, as afterwards.

The clear fluid which fills the scales at the white stage is probably not the "hæmolymph," and it seems very doubtful whether the hæmolymph simply, ever enters them, but rather a secretion from it, containing the matters necessary for going through the chemical change, resulting in pigmentation. In the white scales it never contains this pigment basis.

The white scales in the fringes of *P. atalanta* form very easily observed subjects for this investigation; the frequency with which they passed under my observation as objects somewhat difficult to make out, owing to their clearness and transparency, at various and even very late stages of the pigment development in the coloured cells, the specimens being perfectly fresh, and no traces of air (either as completely filling the scales, or as separate bubbles left behind in them) existing, seems alone sufficient to justify my doubt as to the accuracy of Mr. Mayer's conclusions on this one point.

Something might, perhaps, also be said as to the antecedent improbability of a temporary occupation of the cells by air in the way described.

Contributions to the fauna of the Dauphiné Alps.

IV.—THE BUTTERFLIES OF BOURG D'OISANS.—SEXUAL DIMORPHISM OF POLYOMMATUS.—DRINKING BUTTERFLIES.—PARARGE MEGERA AND P. MERA ON THE SAME GROUND.—ON THE OCELLATION OF EREBIA NEORIDAS.

By J. W. TUTT, F.E.S.

From August 12th until the 19th, we collected in the neighbourhood of Bourg d'Oisans, a small village situated on the left bank of the Romanche, at an elevation of 2,400 ft. above the level of the sea. The river here has spread out a great plain, bounded on either side with lofty mountains, the precipices often rising almost sheer from the plain to a height of from 1,000 to 1,500 ft., and presenting, on their exposed faces, remarkable instances of contorted stratification. The country worked here was the fields and slopes directly behind the

Grand Hotel, and the woods behind, leading up to the Alpine pastures at a height of about 6,000 to 7,000 ft. The insects here were, of course, not of an Alpine character, except at the higher elevations, where an occasional *C. phicomone* occasionally reminded us that we had reached to a considerable elevation.

HESPERIDES.—*Spilothyrsus altheae*.—The only specimen of the tribe HESPERIDI observed here, and only three specimens of these. These were larger and browner than the specimens obtained at Le Lautaret. They were in fine condition, and it seemed rather remarkable that the species should be only just emerging here, more than a fortnight later than at Le Lautaret, and at 4,200 ft. less altitude. *Pamphila comma*.—This was the only species of the tribe PAMPHILIDI observed. Again, only a very few specimens, and these large in size, were observed. A very fine ♀ example of the ab. *latro*, Grum., was taken.

PAPILIONIDES.—Div.: LYCENIDA. Fam.: LYCENIDÆ.—*Chrysophanus doris*.—Evidently just appearing, both sexes being in fine condition, though scarce. The females rather red in colour. This is a most interesting species, with its striking sexual dimorphism, appealing to one as a sort of connecting link between the "blues" and "coppers." *C. alciphron* var. *gordius*.—One worn male only, tinged with purple. *C. virgaureae*.—This species was practically over on the slopes just behind the village, but about 2,000 ft. above, on the mountains; although the males were worn, the females were in good condition. *Polyommatus damon*.—The specimens taken here were large in size, and with two forms of the male, one of a much brighter blue than the other. Some of the specimens were very sparingly marked with spots on the underside. *P. corydon*.—Generally large, with a dark hind marginal band on fore-wings = ab. *marginata*, Tutt. The silvery blue-green type was also taken, as also the ab. *caeruleo-marginata*. The females were nearly all of the typical form, without blue scaling. On the under-sides many specimens approached the ab. *striata*. *P. bellargus*.—Two or three male specimens only were captured; possibly the second brood was only just appearing. *P. icarus*.—The typical lilac-blue form occurred, but the bright ab. *clara* was much more abundant. There was also considerable difference in size. The ab. *icarinus* was exceedingly abundant, especially on one little strip of grass near the hotel. The females were all entirely of the form known as ab. *iphis*, Baumb. *P. escheri*.—At this level, the males appeared to be practically over, and only one female was observed. The very distinct sexual dimorphism in these species, and especially *P. icarus* and *P. corydon*, is very marked. There are practically no female specimens with the blue scaling of the male at all developed. These individuals evidently have no very great chance of success here, and hence the colour dimorphism is very sharply marked in these species, as also in *P. escheri*, as is normally the case. *P. astrarche*.—At about 2,000 ft. above the village, where the alpine pastures commence, this species and *P. corydon* were collected in hundreds at all the little runnels that crossed the pathway. They flew up in little clouds in front of one, but quickly returned again. The most remarkable sight of butterflies drinking that I ever saw was on the pathway in the Vénéon valley. There, at one spot of about a square yard in extent, I saw 3 *Papilio podalirius*,

1 *Eu Vanessa antiopa*, 2 *Leucophasia sinapis*, and hundreds of *P. damon*, *P. corydon*, with a few *P. bellargus* and *P. astrarche*. The damp ground was just one seething mass of insect life, the different shades of blue looking brilliant in the sun, the *P. podalirius*, with their wings drawn up closely over the back, and the tails stretched out behind, clear of the damp, were very remarkable looking objects. Nicéville, in his *Butterflies of Sumatra*, gives some interesting notes on this habit.

Div. : PAPILIONIDA. Fam. : PAPILIONIDÆ.—*Papilio machaon*.—Not uncommon. Flying rapidly about the lucerne fields in the morning sun. The specimens of moderately large size; in sufficiently good condition to show that they were a second brood, and very recently emerged. *P. podalirius*.—Much commoner than *P. machaon*, and going over, the species became much rarer during our stay. The specimens haunt the lucerne fields during the morning and noon, but about three o'clock make for the trees, where they appear to roost. They might be seen flying round the tree-tops until the shadow thrown by the mountain walls reached them, and then they immediately settled down for the night. Fam. : PARNASSIDÆ.—*Parnassius apollo*.—Only two or three specimens observed. These were all in a rocky gully behind the hotel. The species did not appear to occur up the mountain slopes behind. Fam. : PIERIDÆ.—*Pieris napi*.—The ♂ specimens were large, very white, and with scarcely a trace of the darker nervures, either on the upper or under-sides. They appear to belong to the var. *meridionalis*, Rühl. *P. rapae*.—The males, with a well-marked apical patch, and one distinct small blackish spot on fore-wing. The females strongly marked and yellowish. Probably these are referable to the var. *manii* of Mayer. *Leucophasia sinapis*.—Common. Many of the male specimens had the apical spot resembling that of the spring form, others were well-marked specimens of ab. *diniensis*. Many of the females were referable to ab. *erysimi*. They were usually on the wing from about 9 a.m. until 2 p.m., rarely later. *Colias edusa*.—Distinctly rare. Not a half-dozen specimens were observed, although I kept a sharp look out for them, wanting eggs for Mr. Merrifield. The specimens caught were in good condition. *Colias hyale*.—Not uncommon, and in fine condition. One could generally rely on seeing a dozen in the course of a morning's stroll. The ab. *apicata* and ab. *intermedia* were both taken, but the marginal band was usually fairly typical. *Colias phicomone*.—Two or three observed on the high pastures. One in a lucerne field low down at the back of the hotel. *Gonepteryx rhamni*.—Very common, especially on the last day or two. The females approached the ab. *intermedia*. Fam. : NYMPHALIDÆ.—*Dryas paphia*.—Rare and worn, evidently passé. *Argynnis adippe*.—In fine condition, moderately abundant, and remarkably typical. *Argynnis lathonia*.—In fine condition; evidently the second brood was just emerging; more easily caught in the lucerne fields than elsewhere. The specimens are very strongly marked, but not dark, like those Mr. Warburg gets at Cannes. *Brenthis dia*.—Abundant in the lucerne fields. The females were in much better condition than the males. *Argynnis daphne*.—One worn specimen only, another, equally worn, was captured on a scabious flower at Bourg d'Aru, and should have been in the list, *ante*, p. 53. *Melitaea aurelia*.—Two or three

female specimens only were observed, possibly the species was over. *M. dictynna*.—Two specimens only captured, in good condition; the male very dark. *M. didyma*.—A few only observed, the males were not worth taking, the females in very fair condition. *Eucanessa antiopa*.—It was a great treat to see these fine fellows flying among the walnut trees, about half-a-mile lower down the valley than Bourg d'Oisans. They were moderately common, but kept well out of reach of the net. *Vanessa io* and *Pyrameis atalanta*.—A few specimens observed, presenting no variation from British specimens. *P. cardui*.—Two specimens only observed, both evidently freshly emerged. *Limenitis camilla*.—Two small males only seen, on bramble blossoms, probably over. *Hipparchia hermione*.—The specimens here are very close to the figures of *H. alcyone*. They are very wary, and on the rough stony ground difficult to capture. *Satyrus actaea*.—The males moderately typical, the females of the ab. *bryce*, Hb. Not uncommon on rocky slopes. *Pararge megaera*.—Rather rare and richly coloured. *P. maera*.—Frequented the same stone walls and rocky watercourse as *P. megaera*, which I thought very strange. The females were large, and the under-sides very grey. Both species were in good condition, and evidently freshly emerged. *Epinephela ianira*.—Exceedingly abundant, the females with the fulvous patch much extended = ab. *hispulla*, Hb., whilst there was also a fair number of examples of the ab. *pallens*, Thierry-M. The under-side of most of the specimens showed a strong tendency to form a distinct band = ab. *grisea*. *E. lycaon*.—Not abundant, flying, as usual, with *E. ianira*. *Coenonympha pamphilus*.—Fairly common, none of the specimens, however, being of the form *lyllus*, Esp. One or two fine under-side aberrations of the ab. *ocellata* were obtained. All the aberrations of the pupillated spot on the fore-wing seemed to occur. *Erebia ligea*.—Two specimens only seen. One a very fine male of dark coloration, and with the characteristic marking on the under-side of the hind-wings, snowy white. The other, a female, quite characteristic of the species. *E. euryale*.—About 1,500 feet above where these two *E. ligea* were captured, a small grassy spot gave a few specimens of *Erebia euryale*, both sexes of which were rather worn. *Erebia goante*.—A single specimen only appears among the captures. It was quite overlooked at the time of capture, and certainly not recognised as that species at the time. *E. aethiops*.—Two females only captured, both of the ab. *leucotaenia*. *E. neoridas*.—Not uncommon on the steep slopes behind the hotel, and occasionally reaching the cultivated fields below. The variation of the ocellation of this species on the fore-wings shows the following results: (1) With a double apical ocellated spot, followed by a small, then by a large ocellated spot = 4 spots. (2) With double apical spot, small spot in next interneural space missed, then a large ocellated spot, then a small one = 4 spots. (3) With double apical spot, then small spot missed, then ocellated spot = 3 spots. (4) With double apical spot, then small spot, then large ocellated spot, then another small spot = 5 spots (in one specimen, right side, only). On the hind-wings, 4 ocellated spots are rare, 3 common; a specimen from Sassenage (near Grenoble) has none. *Melanargia galatea*.—Pretty abundant, and widely distributed; most of the specimens, though, were much worn. They exhibited more black markings than is usual in British examples.

V.—THE LEPIDOPTERA OF THE ROMANCHE VALLEY.

By E. S. HARRISON.

The following general notes may be of interest as supplementing the more detailed notes which Mr. Tutt has so far published on the fauna of this district. The specimens were all captured during August, 1896.

HESPERIDES.—*Pamphila sylvanus*, very abundant at Grenoble. *P. comma*, found in the high grounds and pastures above the village of Bourg d'Oisans. *Spilothyrus altheae*, captured at Bourg d'Oisans.

PAPILIONIDES.—*Chrysophanus virgaureae*, common on the heights above Bourg d'Oisans; *C. dorilis*, two specimens only, both females, at Bourg d'Oisans; *Polyommatus corydon*, *P. damon*, *P. icarus*, very abundant; *Papilio machaon*, throughout the valley (also at Luino, in Italy) most of the specimens were worn; *P. podalirius*, Grenoble, Bourg d'Oisans, etc., very abundant and generally distributed, much more abundant than *P. machaon*; *Aporia crataegi*, Bourg d'Oisans (the females, with very transparent wings, were very abundant in the Monte Genevra Pass); *Pieris brassicae*, *P. rapae*, *P. napi* and *Leucoptasia sinapis* occurred throughout the valley; *Colias hyale*, fairly common at Bourg d'Oisans, where also *C. edusa* occurred, but much less commonly than at Grenoble; *Gonepteryx rhamni*, Bourg d'Oisans, ♀ very common, very little variation; *Dryas paphia*, fairly frequent, both in Dauphiné and Italy (the ab. *ralesina* rather frequent at Torre-Pellice); *Argynnis lathonia*, Bourg d'Oisans, the specimens captured were evidently newly emerged; *A. adippe*, common in Dauphiné (but in Luino, I only captured var. *cleodora*, which, so far as I saw, was the only form there); *A. aglaia*, rare at Bourg d'Oisans; *Brenthis dia*, also at the same place; *Melitaea cinxia*, *M. didyma* and *M. dictynna* were all taken, some of the latter very dark; *Vanessa io*, Bourg d'Oisans (and Torre Pellice); *Euvanessa antiopa*, common at Bourg d'Oisans (those captured at Torre Pellice very large and with yellow margin); *Polygonia c-album*, Bourg d'Oisans (elevation about 4,000 ft.), Grenoble (elevation about 2,100 ft.), [Torre Pellice (8,000 ft.)]. The underside of the specimen caught at Grenoble was of about the shade of the u-s. of *P. cardui*, that taken at Torre Pellice much darker, and at Bourg d'Oisans as dark as u-s. of *V. io*; *Pyrameis cardui* and *P. atalanta*, very generally distributed; *Pararge egeria*, very generally distributed, also great variation in size of fulvous blotches, u-s. tinted very warmly with purple; *P. megera* and *P. maera*, also very generally distributed; *Hipparchia semele*, one specimen (♀) has its markings very indistinct, and is very pale, both on upper and underside; *Hipparchia actaea* and *Satyrus hermione*, from Bourg d'Oisans; *Epinephela janira*, very generally distributed, and varying (upper-side) from unicolorous black-brown with very faint pupillated spot = ♂, to very pale fawn-colour = ♀. The former is deep ochreous on the under-side, underwings almost without trace of band, and showing faintly two small black spots, the latter very strongly banded with only one or no spot; *E. lycaon* and *E. tithonus*, moderately common; *Coenonympha pamphilus*, very generally distributed; *Erebia aethiops*, rare; *E. neoridas*, general in distribution. The variation of the spots extended from 2 to 4 on forewings, and from a mere trace to 4 on hind-wings, some much more highly pupillated than others. Coloration :—From deep fulvous to dark

black-brown. *Melanargia galathea*, Bourg d'Oisans, no variation except in depth of black markings.

SPHINGIDES.—*Macroglossa stellatarum*, Grenoble and Bourg d'Oisans.

ZYGENIDES.—*Zygacna transalpina*, Bourg d'Oisans ; *Z. erulans*, La Grave ; *Z. filipendulæ* and *Z. carniolica* from Bourg d'Oisans.

CHELONIDES.—*Lithosia complana*, Bourg d'Oisans ; *Calligenia miniata*, on the Mont Cenis Pass ; *Callimorpha hera*, Bourg d'Oisans [and Torre Pellice] ; *Nemeophila russula*, Grenoble ; *Spilosoma menthastri*, Grenoble.

LASIOCAMPIDES.—*Gastropacha quercifolia*, ♂, at light, at Bourg d'Oisans.

The following NOCTUIDES were captured at Grenoble :—*Gonoptera libatrix*, *Euclidia glyphica* and *Agrophila trabealis*, whilst the GEOMETRIDES taken in the neighbourhood of the same town comprised :—*Rumia luteolata*, *Metrocampa margaritaria*, *Nemoria viridata*, *Hyria auroraria*, *Asthenia candidata*, *Acidalia ornata*, *Strenia clathrata*, *S. immorata*, *Ematurga atomaria*, *Aspilates gilvaria*, *Lomaspilis marginata*, *Camptogramma bilineata* and *Ortholitha bipunctaria*. The PYRALIDES included *Pyrallis glaucinalis*, *Herbula cespitalis*, *Botys fuscalis* and *Spilodes cinctalis*. Of the TORTRICIDES I have *Teras cantaninana* from Bourg d'Oisans, whilst *Yponomeuta padella* and *Ilithya carnella* were also taken in the same locality.

I have inserted in brackets a few Italian localities, where I obtained the species, both in Dauphiné and Italy.

Hydriomena furcata* (*Hypsipetes sordidata*): Its Synonymy, Variation, Geographical Distribution and Life-history.

By LOUIS B. PROUT, F.E.S.

The whole generic grouping of the *Larentiidae* will certainly require overhauling in the light of modern ideas, but I have as yet done no work which would justify my taking this question into consideration this evening. As some of you may be aware, Lederer got over the difficulty presented by the assemblage of tolerably closely allied genera by lumping them nearly all together as *Cidaria* ; but it is quite certain that this unsatisfactory arrangement will not be allowed to stand permanently. Professor A. R. Grote, in a recent communication to the Entomological Society of London, pointed out two landmarks in what he calls the “*Cidarian wilderness*,” but as for the rest, I would venture little or nothing.

I believe, however, that we have in the so-called genus *Hypsipetes* (by error “*Ypsipetes*”), Steph., a really natural little sub-division, comprising our three European species (all British), a few North American, and one or two others ; being very closely associated in larval form and habits, as well as in the imago state. This genus is the *Hydriomena* of Hübner (*Verzeichniss*, p. 322) and Packard, though the former author included one species, *aqueata*, which is not congeneric. Prof. Grote kindly writes me that this name (*Hydriomena*) appears available, and should be restored.

As to the individual species selected for present consideration, certainly the commonest of its genus in this country, it was named

* Abstract of Paper read before the North London Natural History Society, Oct. 22nd, 1896.

sordidata by Fabricius, in 1794; but there is, at least, one name having a prior claim, and I cannot understand how it is that Werneburg and Staudinger have ignored it; it is accompanied by a figure, and thus has even an advantage over the *sordidata* of Fabricius, of which merely a brief diagnosis is given. The name in question is *furcata*, Borgström (in Thunberg's *Dissertationes*), and the date 1784. Borgström describes it as "alis cinereis, fascia simplici bifida et trifida fuscis. Wings entire, rounded; fore-wings cinereous, black dusted and fasciated; a slender fascia at the base, and another near this, simple; in the middle a broad fascia bifid towards the outer margin (*i.e.*, costa); at the apex a broad fascia projecting a trifurcate branch," etc., etc. Of *sordidata*, Fb., *Ent. Syst.*, iii., Pt. 2, p. 185, the diagnosis was:—"Phalæna seticornis alis virescentibus; atomis strigisque fuscis punctoque postico atro," and a careful, though brief description, follows. This is mainly the same common swallow-frequenting form as Hübner's *elutata* (fig. 224). Guenée takes this green form as the type, and gives three varieties:—(A) Entirely green, without the dark bars; sub-var. grey-blackish, also without markings. (B) Hübner, fig. 382, a curious and rare aberration. Guenée includes here the specimens with the black bands very pronounced, entire, and multiplied, and the central area paler. (C) Hübner, figs. 381, 313.—The green ground-colour replaced by brick-red, or sometimes by carmelite brown. This last is the "var. *fusco-undata*, Don.," of Staudinger's *Catalogue*, and Guenée has an interesting note upon it. He notes its smaller size, and agrees with Herrich-Schaeffer, that it belongs to the bilberry-fed examples; and he then adds that Delaharpe considers this variety is artificial, and may be produced at pleasure by exposing the insect to an acid vapour; but he (Guenée) is satisfied that it is perfectly natural. He possessed recently disclosed examples, met with under the same conditions as ordinary green forms, and he points out that green lepidoptera, especially those of an olive-green shade, are peculiarly subject to these colour changes—*e.g.*, *Smerinthus tiliæ*.

Staudinger, in his *Catalogue*, gives two named varieties: (1) "ab. (et v. ?) *fusco-undata*, Don. (*Nat. Hist.*, xi., pl. 386, fig. 3), testaceous or reddish, black banded." (2) "v. (et ab.) *infuscata* (? *tacetaria*, Frr., 640-2 ab.) al. ant. fere unicolor. infuscatis vel grisescentibus, indistincta nigro-strigatis." Some of Staudinger's own Iceland specimens, from which this variety was named, are in our collection at South Kensington. None are so dark as our extreme British melanice examples.

In North America, where also the species appears to be common, we find two other well-marked varieties, named by Packard; they were at first described by him as distinct species, and it seems to me not improbable that one at least of them will really prove to be so. The varieties in question are *nubilofasciata*, Pack., *Proc. Bost. Soc., N. H.*, xiii., 398, *Monograph*, Pl. viii., fig. 31; and *albifasciata*, Pack., *Sixth Rep. Peab. Acad. Sc.*, 41, *Monograph*, Pl. viii., fig. 34.

I have not been able to give sufficiently close and continuous study to the details of variation to work out anything very satisfactory in this connection at present; but a few generalisations may perhaps be found of some assistance:—(1) *Size*.—This varies a good deal, from considerably under an inch to slightly over an inch and a quarter; the

chief point of interest being in the generally smaller size of the bilberry and heath form, as compared with those which breed in low-lying districts on sallow. (2) *Colour*.—The ground-colour of the sallow forms is generally dirty greenish, frequently tinged more or less with reddish, especially in the median area. The moorland or mountain forms are, as is generally known, by far the more variable as a rule; often wholly reddish or yellowish-brown; at other times cinereous, or more frequently fuscous, or nearly black. Mr. G. T. Porritt has kindly sent for my inspection the pick of his series, bred from bilberry, from a wood on the hill-side near his own residence, at Huddersfield. He writes me that a large proportion is of the unicolorous, or nearly unicolorous, black form, though he has not sent very many, as this offers less range of variation than the more variegated forms. It is further to be remarked concerning coloration, that the colour is often more or less varied with whitish, or even with clear white. The usual positions for the pale portions are the median band, and a central roundish blotch on the sub-terminal dark band, this latter blotch being often extended right to the inner margin, leaving only the characteristic trifurcate sub-apical mark dark. (3) *Markings*.—I have already touched on these in dealing with the colour variation, and need only add that the dark bands are very inconstant. The basal dark mark, and the inner broad band, are the least so; the outer broad band also, as already noticed, is but seldom wholly obliterated. Two narrower bands between these two are generally broken off at the middle of the wing, but either or both of them may often continue right to the inner margin, and either or both of them may, on the other hand, be wanting altogether; or, once again, they may unite at the middle of the wing, with the two broader bands in a very irregular Y-form. The pale spot in the centre of the outer dark band is fairly constant, and has been pointed out as a distinguishing mark of the species; but it is occasionally absent.

Out of this heterogeneous material I have only ventured, at present, to work up the following rough table of named forms, based chiefly on colour differences.

Genus: *HYDRIOMENA*, Hb., *Verz.*, p. 322 (Type: *autumnalis*, Ström. = *trifasciata*, Thnb. = *impluriata*, Hb.).

Furcata, Thnb., *Diss.*, i., 13 [1784]; *Miata*, Hfn., *Berl. Mag.*, iv., 524 [1767] *rec. L.* *Rectangulata*, Fb., *Syst. Ent.*, 636 [1775] *rec. L.* ? *Virgata*, Fourer., *Ent. Paris.*, ii., 285 [1785]. *Sordidata*, Fb., *Ent. Syst.*, iii., 2, 185 [1794]. *Flutata*, Hb., 224 [post 1797]. *Fusco-undata*, Don., *Nat. Hist.*, xi., 73 [1806].

1. Cinereous, with dark bands (the type form, in bibliographical sense) = *furcata*, Thnb. : ? *tacetaria*, Fré.
2. Cinereous, without distinct bands, ? = *infuscata*, Stgr., *pro parte* : = *cinereata*, mihi.
3. Green, with dark bands = *sordidata*, Fb.
4. „ without „ „ = *obliterata*, mihi : var. A, Gn.
5. Testaceous (or reddish), with dark bands = *fusco-undata*, Stgr. : Don. *pro parte*, var. C, Gn.
6. Testaceous (or reddish) without dark bands = *testaceata*, mihi.
7. Fuscous, nearly unicolorous = *infuscata*, Stgr. : sub-var. of var. A, Gn.
8. With whitish median band = ? *albifasciata*, Paek.

I only add, in connection with this tabulation, that probably the really red forms should be separated from Nos. 5 and 6, and that our ordinary whitish banded forms ought to be denoted by such "long-winded" titles as *sordidata-albifasciata*, etc., according to the ground-colour; it seems unreasonable to suggest a different name for each of these sub-varieties, and yet their effect is so very distinct, that it hardly appears right to ignore them. Guenée's var. B is to be referred here.
(To be continued).

Notes on the Zygænidæ.

I.—GENERAL REMARKS ON THE GENUS ZYGÆNA.—ZYGÆNA LONICERÆ A CONSTANT SPECIES.—HYBRID ZYGÆNIDÆ.—HAVE WE THREE FIVE-SPOTTED BRITISH SPECIES (EXCLUSIVE OF *Z. exulans* AND *Z. meliloti*) IN BRITAIN?—ARE *Z. hippocrepidis*, ST., AND *Z. filipendulæ* DISTINCT BRITISH SPECIES?

By J. W. TUTT, F.E.S.

This is meant to be a tentative paper, and is written in the hope that it may lead to observations being made during the approaching summer, and to the record of new facts. We do not by it invite opinions, of which there will doubtless be many; but we do hope it will lead to the making of an attempt, by exact observation, to clear up the present hopeless confusion that exists about some of our British species of this genus.

In previous papers we have attempted to solve some of the difficulties relating to certain Zygænid species, viz., *Z. minos* (*Ent. Rec.*, vi., pp. 270–276), *Z. exulans* (*Ent. Rec.*, v., pp. 258–267), *Z. carniolica*, *Z. achilleæ*, *Z. transalpina*, *Z. medicaginis* and *Z. ochsenheimeri* (*Papers on the Zygaenidae*, 1894). The notes relating to *Z. medicaginis* and *Z. ochsenheimeri* are particularly important to British lepidopterists, because the first has been erroneously considered an Alpine form of *Z. trifolii*, and the name of the latter Alpine species has even been introduced into our magazines as a British form of *Z. filipendulæ*. We simply mention these as we do not intend to traverse the ground already covered.

The genus *Zygaena* is exceedingly interesting, from the facts that some of the species are somewhat ill-defined, and that, in some cases, the species hybridise pretty freely with each other, and produce fertile progeny. The collector gets over the difficulties thus presented by lumping the various forms as one species, but the student recognises that if evolution be really a fact, and that new species are evolved from earlier forms by modification, it is pretty certain that nature is now at work on some plastic forms, and is, so to speak, developing new species. We have, in the genus under consideration, this process of evolution taking place before our eyes, and whether we unite all the forms into one group and call it a species, and its component parts sub-species, or allow each of the latter to be called a species, it is only a matter of terms, and does not interfere with the scope of our enquiries.

Of the five-spotted Zygænidæ occurring in Britain, *Z. exulans* and *Z. meliloti* are the most fixed forms. *Z. loniceræ* is also a most constant species. In all its British localities it is practically invariable and readily recognisable. There is no difference whatever in

the general facies of the specimens captured in the Alps of Dauphiné the Tyrol, Kent or Yorkshire.

The essential difficulties of the group, so far as our British species are concerned, lie in the study of *Z. trifolii* and *Z. jilipendulæ*. Before considering these, however, in detail, it may be well to observe that (1) *Z. loniceræ* has been crossed with *Z. jilipendulæ*, and the hybrid progeny, although exceedingly large, failed to produce fertile eggs. Mr. Fletcher, however, does not consider that this proves the hybrids to be infertile *inter se*, although he was unsuccessful with this particular brood. (2) *Z. loniceræ* has been crossed with *Z. trifolii*, and the hybrid progeny have proved fertile *inter se* to the fourth generation. (3) *Z. ochsenheimeri* from the Alps (Courmayeur), and *Z. jilipendulæ* (Sussex) have been crossed, and the hybrid progeny produced fertile ova.

Mr. T. H. Briggs was, we believe, the first entomologist to point out that we had in Britain three very distinct five-spotted Burnet moths (excluding *Z. exulans* and *Z. meliloti*) with distinct life-cycles. (1) The early (and small) *Z. trifolii*, found usually in pastures and meadows in May and early June (often with *Procris statice*). (2) The well-known and well-defined *Z. loniceræ* occurring in June and early July. (3) The late (and large) *Z. trifolii-major* found in marshes in July and early August. Very few entomologists appear to know all three of these in a state of nature. Exact and comparative life-histories of the first (*trifolii*) and last (*trifolii-major*) are very much needed.

Another difficulty has to be explained, *viz.*, the nature of the relationship existing between the two forms of six-spotted Burnet moths that exist in Britain. These are *Zygaena hippocrepidis*, St., and *Z. jilipendulæ*, Linn. The former occurs with (or just a few days later than) *Z. trifolii*, and in the same or similar localities to those frequented by this species. Having six spots, the specimens are usually referred to as *Z. jilipendulæ*, although those who have recorded them as such have usually stated that the true *Z. jilipendulæ* has been, even in neighbouring localities, in the larval state, whilst these aberrant six-spotted specimens were flying. These six-spotted specimens have usually the marginal band of the hind-wings broader, and the sixth (outside) spot of the fore-wings less well-developed, than in *Z. jilipendulæ*; and Boden, who observed in a series of Continental *Z. ochsenheimeri* (for sale in Stevens' rooms), the ill-developed sixth spot, referred our May and June six-spotted specimens to *Z. ochsenheimeri*, and the name has been erroneously applied to them ever since. Wood figures a yellow aberration of this form under Stephens' name. This difficulty has been complicated by the fact that we have a common aberration among true *Z. jilipendulæ*, parallel, so far as the peculiarity of spotting in these early *Z. hippocrepidis* and *Z. ochsenheimeri* is concerned, and hence we find, in collections, a mixture of *Z. hippocrepidis* and the aberrations of true *Z. jilipendulæ* which assume a similar form.

The difficulties of our British species do not seem to extend to the late (July and August) *Z. trifolii*, which, in its marshy haunts, is rarely overrun by the other species. The only difficulty that I have observed is one with regard to Weston's specimens, referred to by Briggs, and quoted later on in this paper.

(To be continued.)

SCIENTIFIC NOTES AND OBSERVATIONS.

A STATISTICIAN WANTED.—I should like to draw attention to what would be exceedingly valuable in reference to the records of captures, double-broodedness, and many other phenomena. It is that there should be prepared a statement of the weather, showing earliness or lateness of the seasons for say thirty or fifty years back. Anyone who is a Fellow of the Meteorological Society can get all the particulars. What is wanted are the temperature, rainfall and sunshine for each month for Greenwich or Kew, and, if possible, some station in or near York and Aberdeen, and perhaps South Wales; with general remarks on the earliness or lateness of season (spring and summer), as showing by budding or blossoms, or appearance of certain insects, very true to season, in their exclusion from pupa. It would be invaluable for many biological purposes. The stations selected should be near sea-level. There is a reputation to be earned by any trustworthy person who would do this work.—F. MERRIFIELD, F.E.S., 24, Vernon Terrace, Brighton.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

REARING *POLIA XANTHOMISTA* VAR. *NIGROINCTA* FROM THE EGG.—With regard to the rearing of *P. var. nigroincta*, I failed completely in 1896, as have all your correspondents, but in 1895, under different conditions, I was successful in breeding two examples of the moth. The larvæ were kept in the open on potted plants of the narrow-leaved plantain, gathered on the shore near here.—F. G. WHITTLE, 3, Marine Avenue, Southend. *March*, 1897.

A note not having appeared in reply to Mr. Christy's inquiry as to whether anyone has had success in rearing the above species from ova (*Ent. Rec.*, viii., p. 241), I think it only just to Mr. Murray to record mine, which, although not great, may be an encouragement to others to try again, and do still better. In 1895, Mr. Murray kindly sent me, as a present, two dozen ova; twenty duly hatched, the larvæ feeding very slowly on a species of willow, with small and hard leaves; the whole twenty eventually entering the soil in their breeding cage. On Sept. 2nd, two moths emerged, and a third on the 7th. As no more appeared during the following fortnight, the earth was turned out, when it was found to contain three pupa-skins and seventeen dead larvæ.—B. A. BOWER, F.E.S., Lee, Kent. *March*, 1897.

FOOD-PLANT OF *LASIOCAMPA CALLUNÆ*.—At St. Bees, last September, I noticed large numbers of *L. callunæ* feeding on the flowers of stunted gorse on the sea-coast. So abundant were they that some hundreds might have been collected in an hour. I had never seen them so abundant before.—A. ROBINSON, B.A., F.E.S., Sylvanhoe, Chislehurst.

DESCRIPTIONS OF LEPIDOPTEROUS EGGS (*Continued from p. 61*).—*Dicylea oo*.^{*}—The egg of this species is the most aberrant Noctuid egg that I have observed. It is of a honey-yellow colour, and looks almost spherical to the naked eye. It is attached by the base in

* On pointing out the peculiar egg of this species, Mr. Bacot informed me that the head of the mature larva of *D. oo* is also aberrant, being somewhat square in shape, and notched like that of *Apatela aceris*.

ordinary Noctuid fashion. Under a two-thirds lens the base is seen to be somewhat contracted below the equatorial area, and there is a large basin-shaped apical depression. At the bottom of this, one traces a minute, central, circular ridge, within which is the micropyle, but the structure is difficult to make out. There is no trace of ribbing (vertical or transverse) even with a one-sixth lens, only the merest traces of longitudinal striations, on what otherwise appears to be the perfectly smooth and shining surface of the egg. The egg-shell is apparently transparent. Mr. Barnes (to whom I am indebted for the eggs) wrote, on Nov. 15th :—"The eggs of *D. oo* were laid on June 19th, 1896, and have not changed in colour since they were deposited." [The eggs were described on Jan. 14th, 1897, when their colour was still unchanged].

Porthetria dispar.—The egg is almost spherical, pale salmon colour soon after being laid, but quickly becoming of a dirty-brown colour, owing to the development of the embryo. The surface of the shell appears almost smooth under a two-thirds lens, but under a high power is covered with fine hexagonal reticulation. At the apex of the egg is an open, basin-shaped depression, the micropylar rosette being indistinctly traceable at the bottom of it. The shell is evidently transparent, and now (Jan. 15th, 1897) the head parts of the embryo are very distinctly visible through it. The eggs are laid side by side, thickly covered with brown hairs, from the anal tuft of the female. Sometimes the eggs are laid upon each other. They are always laid in patches, which vary, however, greatly in size.—J. W. TUTT.

NOTES ON COLLECTING, E & c.

NOTES OF COLLECTING IN 1896.—*Southend and Canvey*.—Until the end of July, the season here was very good, but after that time sugar was all but useless. Our local insects all appeared in increased numbers. I obtained a few cases of *Epichnopteryx reticella*, from which, in due course, females occurred, and these attracted a crowd of males. On June 9th I found larvæ of *Lithosia complana* and *Thymelicus lineola*, the former on a lichen-studded post. Both pupated in due course, and the moth emerged on July 12th, the butterfly on July 1st. *T. lineola* was unusually common, during the first week of July, at Canvey; *Melanargia galatea* occurred at the same time, but was restricted to one field. *Polygonmatas astrarche* was the butterfly on the sea-wall, on the southern side of Canvey, on August 3rd, when it was most abundant. I only saw one *Vanessa io*, one *Pyramis cardui*, and not one *P. atalanta*. I netted a female *Phorodesma smaragdaria* on the evening of July 22nd, and on the 26th I boxed a very fine male of the same species, and *Timandra amatoria* and *Acidalia marginipunctata* occurred more commonly than usual. *Olisiocampa castrensis* also were more abundant than in 1895, but there was less variation in the imagines, and females occurred in about the proportion of $3\frac{1}{2}$ to 1 male. Swarms of Noctuids came to sugared black-thorn and reeds at the end of June and well into July, *Leucania straminea* (larvæ found at the same time), *Hadena aljecta* (not much variation), and *Calamia phragmitidis* were among the best. *Hydrocya nictitans* (? *H. paludis*, Ed.) also presented considerable variation. *Hermipia cribralis* occurred rather commonly, and *Eupithecia subnotata*

was taken among *Atriplex*. During August I took one *Aglossa cuprealis* and two *Cirrhoedia xerampelina*. During October, *Calamia litosa* swarmed in a reed bed near here, and the specimens vary very much in size and colour.—F. G. WHITTLE, 3, Marine Avenue, Southend.

Cumberland.—The season of 1896, at Keswick, was a very moderate one. My first excursion was to Watendlath for *Emmelesia adaequata* (*blanliata*) on May 23rd, when I also captured a few freshly emerged *Larentia salicata*, *Filonia atomaria*, *Bombyx rubi*, *Melanippe montanata*, *Ephippiphora cirsiaria*, *Catoptria cana*, and *Eupithecia nanata*. On the 26th, I went again and took about thirty *E. adaequata*, several pairs in cop. On June 8th, I captured a fine lot of *Melampias epiphron*, also *Crambus ericellus* and *Nemophila plantaginis*, but *M. epiphron* was out on June 2nd, the earliest date I know, and it may be well to remark that this species strayed almost a mile from its usual haunts, and several hundred feet lower down than they have ever been captured before. During the fortnight ending June 25th, I sugared several times, and captured *Aplecta tincta*, *Xylophasia polyodon* (all shades from pale grey to black), *A. nebulosa*, *A. prasina* (*herbida*), *Plusia interrogationis*, *Cymatophora fluctuosa*, *Triaena psi*, *Leucania impura*, *Xylophasia rurea*, and its ab. *combusta*, *Dryobota furva*, *Apamea gemina* and its aberrations, *A. unanims*, *Miana strigilis*, *M. fasciuncula*, *Rusina tenebrosa*, *Lycophotia strigula*, *Cleoceris viminalis*, *Hyppa rectilinea*, *Erastria fasciana*, and many commoner species; whilst I also captured *Geometra papilionaria*, *Zonosoma pendularia*, *Acidalia fumata*, etc. On July 10th, *Thyatira batis* appeared, and on the 12th and 13th *Argynnis aylaia*, *P. interrogationis*, *P. chrysitis*, *P. iota*, *Uropteryx sambucata*, *Larentia caesiata*, *L. olivata*, *Emmelesia unifasciata*. On the 14th, *Stilbia anomala*, *Cymatophora fluctuosa*, *Eupithecia subfulvata*, *Drepana lacertinaria*, *Dyschorista suspecta*, and *Celaena haworthii*. On August 10th, I took *Calocampa solidaginis*, *Noctua dahliei*, *Epione apiciaria*, *Ennomos erosaria* (the first specimen captured here), *Mania maura*, *Hydroecia lucens*, *Noctua glareosa*, *Cirrhoedia xerampelina*, *Phibalapteryx vittata*, *Cidaria siterata*, and many other species. It may be worth mentioning that *Noctua dahliei* and *Dyschorista suspecta* were scarcer than usual, and that I did not see a specimen of *Agrotis agathina*. On the other hand, the larvae of *Phalera bucephala* were exceedingly abundant.—H. BEADLE, Keswick.

Folkestone.—I have nothing to be jubilant over with regard to collecting in 1896. At Folkestone, sugar, in July and August, was an absolute failure. I noticed *Melanargia galathea* were more abundant than usual, and *Polyommatus corydon* and *P. bellargus* were in good numbers. *Acidalia marginepunctata* was to be obtained by diligent and daily searching on the face of the cliffs. The only capture that interested me was a female *Porthesia chrysorrhoea*, which I kept for ova. Of these I have a good supply, but, alas! they are still ova, and I understand that this species hibernates in the larval state. I may add that I spent a considerable time on several successive days in the hopes of turning up other specimens, but without success. My wife saw a ragged specimen of *Pyrameis cardui* flying across the Downs, and a day or so later captured another, rather the worse for wear. These were all that were seen of this species, although in other years it has been noticed to be abundant. At Dover, I saw a young collector capture a beautiful specimen of *Colias hyale*, but I heard of

no others being captured. *Argynnis aglaia* was abundant, and I heard that *Cupido minima* was plentiful as a first brood on Whit-Monday. Larvæ of *Sphinx ligustri* were common on privet, a collector telling me that he took over 60 in two hours. A local professional collector observed two *Colias edusa* in June, but none since.—H. E. PAGE, F.E.S., 25, Casella Road, New Cross, S.E.

New Forest.—I was in the New Forest in the middle of July, and append a few notes, although we took nothing extraordinary. Amongst the Diurni a few *Gonepteryx rhamni* were seen (both sexes), but it was not very common. *Dryas paphia* was getting worn, but we took one or two interesting aberrations, which have been exhibited at the City of London Ent. Soc., and mentioned in the *Ent. Record*. Besides these, we also captured two white-spotted ones—1 ♀, 1 ♂, and a few *Argynnis adippe*. *Eugonia polychloros* came fairly freely to sugar. We were not fortunate enough to take any of the black *Limenitis sibylla*, and we only captured two *Apatura iris*, 1 ♂ and 1 ♀, the latter dying without ovipositing. (*Melanargia galatea* was fairly common at Swanage). A brood of *Pararge egeria* was coming out in the Forest. *Hipparchia semele* was plentiful (in both localities), the ♀ getting commoner towards the end of our stay, and it came to treacle, as did also *Epinephele javira* and *E. tithonus*. *Zephyrus quercus* swarmed round one small oak in an enclosure; *Chrysophanus phlaeas* was rare, but we took one dark one approaching the ab. *cleus*. *Coenonympha pamphilus*, *Plebeius aegon*, *Cyaniris argiolus*, *Pamphila sylvanus*, and *Thymelicus linea* were seen (also *T. actaeon*, at Swanage). Generally speaking, however, we noticed nothing very particular as to the abundance or otherwise of the day-flying Lepidoptera. Among the moths, *Nola strigula* came fairly freely to sugar, but they were nearly all very worn; and *Nudaria senex*, *Calligenia miniata* and *Lithosia mesomella* were in a similar condition. Single specimens of *L. helveola* and *L. complana* turned up, the former on a tree-trunk, the latter on a sugared post. *Ellopiopsis fasciaria* and *Pericallia syringaria* were over. *Cleora glabraria* was commoner than we had ever seen it; we took eight in two days—they were mostly in bad condition, and though all the ♀s were kept for ova, the result was *nil*. *Boarmia abietaria*, too, was not scarce, and we captured a few very fine ones on the larch trunks. It is a rather difficult species to see, and it has a habit of flying off suddenly as you approach the trunk, and dropping sharply to the ground and resting there; fanning the trunks for them is a good dodge. *Tephrosia bistortata* (2nd brood) were mostly worn, and we only trod up one *Gnophos obscurata*. *Epiphyra orbicularia* did not fly so freely as usual, or perhaps it was over, and *Acidalia straminata*, *A. emarginata* and *A. inornata* were also rather worn. We only saw one *Macaria alternata*, and two or three *Pachygenia hippocastanaria* and *Collix sparsata*. Sugar was decidedly poor, except for the "crimsons," and in the Nocturnes generally we did not do so well. We found one *Thyatira batia* at rest (I had never seen but one in the daytime before, and that sat on a fence). It was sitting on a small fir-branch, with the head towards the trunk, the wings close to the twigs, except at the tips, reminding one rather of *Asphablia flavicornis*, and the petal-like spots did not render the insect at all conspicuous. We made our first acquaintance with *Acrionicta leporina*, taking one at sugar. *Leucania turca* and *L. pudorina* were worn; a few *Caradrina*

alsines and *taraacaci* put in an appearance. Of the yellow underwings we took two *Triphaena jimbria* and two *T. subsequa*, one a beauty, the other was kept on chance of its being a ♀, but died on the 15th. We were glad to find a few *Dyschorista suspecta* at sugar, which was a new species to us. Amongst the smaller Noctuids we took a few *Erastria fasciana*, *Anarta myrtilli*, *Heliothis dipsaceus* and *Hydrelia unca*; and of the Pyralids, *Tholomiges turfosalis* was common, but very worn, and a few *Hyphenodes costæstrigalis* and *Rivula sericealis* survived to welcome us. Finally, *Aventia flexula* seemed much more plentiful than usual, but was in tatters.—A. F. BAYNE.

DASYCAMPA RUBIGINEA AT SLOUGH.—Among other insects captured last autumn, I took three specimens of *Dasyampa rubiginea*, which are, perhaps, worth recording.—J. B. WILLIAMSON, 2, Hencroft Street, Slough.

MOTH TRAPS.—I should like to try "light" here during the coming summer. Will any of your readers give a short but clear account of the structure, and mode of working, of one that has proved successful?—E. M. CHEESMAN, Old Bank House, Stromness, Orkney.

TEPHROSIA BISTORTATA (CREPUSCULARIA) IN MORAYSHIRE.—I herewith send you the only specimen of the Tephrosias (whose specific distinctness is being discussed) that I have ever taken. I found it on Saturday, April 16th, 1892, resting on the trunk of a fir tree in the Altire Wood, near Forbes, Morayshire. I have always supposed it to be *T. crepuscularia* (*biundularia*), but my series of *T. bistortata* and *T. crepuscularia* are so completely mixed up, owing to my having no personal experience of either species, that I should be pleased to have your opinion about it.—A. HORNE, Aberdeen. [The specimen is a very fine male example of the Perthshire type of *T. bistortata*, and, like the darkest of the specimens from that locality, approaches more nearly to the typical Continental *T. bistortata*, than the specimens from any other British locality.—ED.]

CAPTURES IN ORKNEY IN 1896.—The following is a list of the Lepidoptera that I captured in Orkney last year. I have marked the species that were common thus—"!", those that were very common thus—"!!." Those which have no mark were not common. SATURNIIDS.—*Saturnia pavonia*!. LASIOCAMPIDES.—*Lasiocampa quercus* var. *callunae*. CHELONIDS.—*Nemeophila plantaginis*, *Arctia caia*!, *Spilosoma fuliginosa* var. *borealis*. NOCTUIDES.—*Hydroecia micacea*!, *Xylophasia rurea* and ab. *alopecurus*!!, *X. polyodon* and ab. *infusata*!!, *Caradrina quadripunctata*!, *Mamestra furva*, *M. brassicae*!! (a specimen of this species was brought to me by a friend, who found it in the house on Jan. 12th, 1897), *Apamea gemina* and ab. *remissa*!!, *Apamea didyma*, *Mianis fasciuncula*!!, *Agrotis suffusa*, *Noctua glareosa*!, *N. plecta*, *N. c-nigrum*, *N. rubi*, *Graphiphora augur*, *Triphaena pronuba*!, *Taeniocampa gothica*, *Scopelosoma satellitia*, *Mellina circellaris*, *Brotolomia meticulosa*, *Hadena adusta*!, *H. dentina*, *Calocampa vetusta*, *C. exoleta*, *Cucullia umbratica*, *Habrostola tripartita*!!, *Plusia pulchrina*!, *P. gamma*. GEOMETRIDES.—*Ematurga atomaria*!, *Cheimatobia brumata*!, *Eupithecia satyrata*, *E. nanata*, *E. pumilata*, *Hypsipetes sordidata*, *Melanippe fluctuata*!!, *Coremia munitata*, *Cidaria prunata*!, *C. testata*. PYRALIDS.—*Scoparia zelleri*!, *Xylophora oxyacanthella* (*fabriciana*). CRAMBIDS.—*Aphomia sociella*, *Crambus pratellus*,

C. culmellus. TINEIDES.—*Ecophora formosella*. TORTRICIDES.—*Ephippiphora pflugiana*, *Tortrix rosana*!!, *Peronea sponsana*!! (? Ed.), *P. variegana*!!, *Catoptria ulicetana*. HEPIALIDES.—*Hepialus humuli*!—E. M. CHEESMAN, Old Bank House, Stronness, Orkney. March, 1897.

NOTES ON *ACIDALIA RUSTICATA*.—This species used to be very abundant at Higham, among the herbage by the roadside, and for some years has been much over-collected in its restricted habitat. It has now become comparatively rare, and I believe the same collectors still go annually to get as many specimens as possible. I was always inclined to consider its food-plant *Parietaria*. I afterwards found the insect on the undercliff, at Kingsdown, between Deal and Dover, quite near the sea, and here again it was attached apparently to *Parietaria*. Mr. Webb writes that: "Greenhithe was for many years the only known locality for *A. rusticata*; there it affected a dusty piece of hedge by the side of the road, and was not found elsewhere." He further states that this species "occurs on both sides of Dover, and not in dusty places at all." Mr. Richardson says that he finds "*A. rusticata* in places where pellitory grows, at Portland; but it does not appear to be specially attached to that plant, and is not, as a rule, beaten out of it. The moth occurs in various spots, all near the sea, some within twenty or thirty yards of it. It has no taste for dusty spots in Portland, as far as I know." It may interest our readers to know that I took this interesting little species in the magnificent gorge, which the Romanche has cut in its passage between La Grave and Le Freney, at an elevation of about 4,500 feet. Here it occurred among the rocky *débris* at the foot of the mountains, and here again I observed the *Parietaria*. Still there may be no real connection between the moth and the plant.—J. W. TUTT. March, 1897.

EARLY COLLECTING NOTES.—The season appears to be a very early one thus far. Mr. E. W. W. Bowell (Sissinghurst) states that two *Asphalia flavicornis* obtruded themselves on his notice on the evening of Feb. 27th. Mr. Hamm (Reading) writes that "the season is again very early, *Phigalia palaria* and *Hybernia leucophaearia* being taken as early as Jan. 5th, on the gas lamps. On Feb. 13th, the latter species, as well as *Anisopteryx arcularia*, *Tortricodes hyemana* were common, whilst one ♂ *Cheimatobia brunata*, and several *Hybernia marginaria* occurred. On Feb. 27th, five male *Nyssia hispidaria* were captured, whilst *Peronea ferrugana* and *T. hyemana* were flying in numbers. A few *Epiyraphia arellanella* were also found on the twigs. *Asphalia flavicornis* was in numbers on birch twigs; the latter is quite 8 or 10 days earlier than I have seen it before." Mr. Day (Carlisle) writes:—"I was rather surprised to see a specimen of *X. areola* at rest on a tree trunk on February 28th; the date is fully three weeks earlier than I have previously observed it. The weather of the past fortnight has certainly been mild, but not sufficiently so to warrant such an early emergence. Such moths as *Hybernia ruficaprararia*, *H. marginaria* and *Phigalia pilosaria* have appeared normally, so that this appearance of *X. areola* must evidently be capricious." A note from Dr. Chapman, dated Feb. 27th, and written from Cannes, states that he has "seen *Pararge egeria*, *Callophrys rubi*, *Anthocharis belia*, *Pieris rapae*, *P. napi* and *P. brassicae* on the wing, whilst *Macroglossa stellatarum* is abundant, but spring," the doctor adds, "is hardly on yet." Mr.

Christy (Emsworth) says that, "on Jan. 20th, he took what appeared to be a freshly-emerged male specimen of *Phigalia pendaria* at rest, out of doors." Dr. Chapman writes again on March 8th, from Cannes: "I took a *Lampides boetica* yesterday, very worn," whilst, on the 9th, he writes: "I have seen *Gonepteryx cleopatra*. *M. stellatarum*, in all conditions, is common. I have seen none ovipositing, all on walls and hot banks, flying in the manner you wot." On March 18th, the doctor further reports the capture of a *Polygonia egea*.

CURRENT NOTES.

Mr. Harcourt Bath thinks that the Fellows of the Entomological Society are a poor lot not to be able to see that "Darwin" and "Wallace" and "amixia" are responsible for the extermination of British Lepidoptera. We would like to know whether the "insular isolation" of, and influence of "amixia" on, *Lycaena arion*, are any greater to-day than they have been at any period—say—for the last twenty thousand years. We have an idea, too, that we have seen a small bird or two occasionally in France. But, evidently, Mr. Bath should be a Fellow of the Entomological Society, in order to explain Darwin's views more fully to the members of that much over-estimated and self-satisfied body.

Mr. Kane records the capture of a small specimen of *Leucania unipuncta* (extranea), at Timoleague, on the coast of Cork, at sugar, on a railway post, in September last. This is the second Irish capture, the other being taken in the same month, at Clonbrock, co. Galway.

The Nonpareil Entomological and Natural History Society held a very successful exhibition of natural history objects at their meeting rooms, on the evening of Feb. 18th, 1897. Much credit is due to the secretaries and committee, who had the matter in hand. There was a large number of visitors.

Mr. Tutt read a paper on "The Variation of Lepidoptera and its causes," at the meeting of the Essex Field Club, held on March 6th, at Buckhurst Hill.

We would call attention to the fact that the Rev. Prof. Wiltshire (25, Granville Park, Lewisham, S.E.), the secretary of the Ray Society, can still supply the early volumes of Buckler's *Larvae of Butterflies and Moths*, to the more recent recruits to our ranks.

Mr. Graf-Krüsi again brings his nets to the notice of British entomologists. We have no hesitation in recommending them to our readers, as we have used nothing else for collecting for the last three or four years.

PRACTICAL HINTS.

Field Work for April and May.

By H. H. CORBETT, M.R.C.S.

1.—The larva of *Cosmia paleacea* is to be found at the end of May or beginning of June on birch. Beat the lower branches hard. The larva is very sickly-looking, and, before I knew them, I used to throw them away, thinking that they were ichneumonised.

2.—The larva of *Taeniocampa populeti* is to be found at the end of May, between flatly united leaves of poplar. The larva of *Tethra*

subtusa is to be found at the same time and place, but in leaves folded upwards upon themselves.

3.—Aspen leaves that are rolled up like cigarettes will yield *Tortrix branderiana*.

4.—The larvæ of *Sciaphila sinuana* are to be found in the flower heads of hyacinth (*S. nutans*) just before the flowers are over. A distorted head with some silk spun among the flowers, or the corolla closed by silk threads, is sure to contain the larva.

5.—The larva of *Larerna raschkiella* makes long irregular yellowish mines in the leaves of *Epilobium angustifolium*. When looking for them, I always find myself singing—

“White mines they never hold larvæ,

But yellow ones always contain them, I see”—
and this couplet is quite true.

By J. W. TUTT, F.E.S.

6.—At the end of April (20th–30th) the larvæ of *Agrotis candellarii* var. *ashworthii* feed freely and crawl about on the rock-cistus in the day-time, as well as at night. In captivity they will feed on primrose, dandelion (flowers), and sallow catkins.

7.—The larva of *Argyresthia aurulentella* mines the leaves of juniper at the end of April. It never enters the stem.

8.—By the end of April the twisted oxeeye daisies should be collected for *Dierorhampha acuminatana* and *D. consortana*.

9.—Towards the end of April the larvæ of *Nematois schiffmilleriella* feed on the radical leaves of *Ballota nigra*. They live in cases, and drop as soon as the plant is touched, so that the best way is to search the ground around the food-plant for the flat, oblong, figure-of-eight or fiddle-shaped cases, in which they live.

10.—The larva of *Larerna miscella* is to be found mining the leaves of *Helianthemum* towards the end of April.

11.—The larva of *Rhodophora advenella* spins together the hawthorn buds in April or May, or if there be no buds, it spins up the young leaves. It is of a bright green colour with red sub-dorsal lines. The larva can be beaten, but is best obtained by searching (Richardson).

NOTES ON BREEDING AGROTIS AGATHINA.—In the spring of 1891, I obtained many quite small larvæ of *A. agathina*. I kept them indoors on growing plants of *Calluna vulgaris* and *Erica tetralix*. They preferred the latter, and I put them on a growing plant of *Erica* in my garden, secured them, and left them to themselves. The remainder I tried indoors on potted plants, but they died one by one, and none reached the pupal stage. Three moths emerged in August, in the cage out of doors. Acting on this experience, I planted several plants of *Erica tetralix* in my garden during the autumn, and in the spring of 1896 went for the larvæ again. Unfortunately it was a wretched season, and, like everything else, *A. agathina* was very scarce. I only got about 60 larvæ, and of these I sent most to Mr. Porritt, keeping only 15 myself. These 15 I put out when very small (about $\frac{1}{3}$ inch in length) on the growing plants, and left them to themselves, only shifting them to a fresh plant when one was eaten. I probably lost one or two in this process, as I put 12 only on to the last plant, and I did not again disturb them, only examining them occasionally with a lamp. These larvæ produced 8 moths (3 ♂, 5 ♀), but some of these emerged when I was away for a night, and got a bit damaged. Mr. Porritt tried his in captivity, but though

they "went down," or at least a good many of them, he did not breed a single moth. In case anyone, who has hitherto failed, cares to try my plan, it is as follows:—Take a section of a 40 gall. paraffin cask, out of which the oil has been thoroughly burned, place it over the plant of *Erica*, plunging it into the ground to the depth of 6 or 8 inches—the topmost shoots of the plant should be about level with the top rim of the section. Then cover the whole with muslin. I use a light framework of cane to raise the muslin well above the tub and plants.—(Rev.) C. D. ASH, M.A., Skipwith Vicarage, Selby, Yorks.

SOCIETIES.

CITY OF LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.—Feb. 16th, 1897.—HEREDITY NOTES RELATING TO *TÆNIOCAMPA STABILIS*, *DEMAS CORYLI*, AND *ENNOMOS QUERCINARIA*.—Mr. Bacot exhibited two broods of *Tæniocampa stabilis* with their ♀ parents. No. 1, of 19 specimens, contained 9 ♂s (47·37 %) and 10 ♀s (52·63 %). No. 2 contained 10 specimens, the sexes being equally divided. All the specimens were much smaller than their ♀ parents (hardly larger than *T. pulverulenta*). This was probably due to their having been largely fed on sycamore (a food to which they were not very partial), and perhaps also to their having been occasionally allowed to run very short of food. Neither brood seemed to closely follow the ♀ parents, either in tone of ground colour or shading. Considerable variability existed in both broods as to the distance separating the orbicular and reniform stigmata. Mr. Bacot also exhibited 22 specimens of *Demas coryli*, bred during August, 1896, from a ♀ taken in Epping Forest, by Mr. A. F. Dayne, last April. These contained 12 ♀s (or 54·5 %) and 10 ♂s (or 45·5 %). He said: "The ♀ parent I carelessly lost; but, so far as my memory serves me, she was a strongly marked form, the dark and light areas of the fore-wings being sharply contrasted. A tendency in the same direction is noticeable in many of her offspring. The ♀s seem to vary much more than do the ♂s, both as regards size, and also as to the depth of colour and sharpness of outline of the dark band of the fore-wings." Mr. Bacot also exhibited 23 specimens of *Ennomos quercinaria*, containing 13 ♂s and 10 ♀s, bred in 1896, from a ♂ and ♀ of his '95 brood. The parents of both broods were also exhibited. A comparison with the far larger brood of 106 specimens, reared in 1895, showed that the proportion of ♂s to ♀s was almost exactly reversed; the figures for the '95 brood were 56·6 % ♀s and 43·4 % ♂s; while for the '96 brood they were 43·5 % ♀s and 56·5 % ♂. The moths bred during 1896 exhibited but slight variation, the ground-colour being of almost exactly the same tone in all the specimens, only 1 ♀ being noticeably lighter in this respect. They also showed far greater stability as regards the strength of the dark suffusion in the fore-wings. In every case, with possibly one exception (the ♀ previously alluded to), the '96 brood was as dark, or darker, than their parents, and also than their grandparents, if the sexes were taken separately and compared with the grandparent of the same sex. At least one ♀ and many of the males were darker than either ♂ parent or grandparents. In the '95 brood 23 % had hardly a trace of suffusion; 33·66 % were suffused, but to a less extent than their parents; while the remaining 43·34 % were as dark as the

♂ parent, and considerably darker than the ♀ parent, only one ♂ specimen, however, being darker than the ♂ parent. The second crossing (possibly through the action of intra-selection) had apparently tended to eliminate or suppress the pale (?) ancestral strain (determinants). In any case, the difference between the '95 and '96 broods of the same race seemed worth attention. Lastly, Mr. Bacot exhibited 3 ♂ and 4 ♀ specimens of *Ennomos quercinaria*, bred in July, 1896, from ova given him by Dr. Buckell. One had no trace of suffusion, the remaining 6 all being strongly marked in this direction, and one ♂ in particular having the whole ground-colour of both wings of a smoky hue, instead of the usual bright yellow.

LIVING ENDROMIS VESICOLOR.—Mr. Garland exhibited a living female specimen of *Endromis versicolor*, which emerged from pupa Feb. 14th, 1897; also four imagines of *Zygaena lonicerae*, from Enniskillen, 1896, *Plusia pulchrina*, from Enniskillen, 1896, and *Cucullia lychnitis*, bred May, 1896, from Hampshire pupae of 1894.

REMARKABLE ABERRATION OF DROMIUS 4-NOTATUS.—Mr. Heasler exhibited a remarkable aberration of *Dromius 4-notatus*, taken under bark at Richmond in Jan., 1897. The head was shorter, flatter, and broader; the eyes being closer to the anterior margin of the thorax than was usual, owing to the short neck. The head was also strongly alutaceous and striated at the sides, making it appear very dull, whereas in the type form it is shiny, owing to the striæ being obsolete and the surface very finely alutaceous. The thorax was depressed on the disc, and the central channel fine and sharply defined. The upper surface was very dull and rugulose with scattered transverse striæ. In the type form the disc of the thorax was convex, with a broad central channel, and was very shiny. The elytra had the striæ rather deeper than in the type form. On the underside, the head and thoracic segments all exhibited the coarse striation and dull appearance, so different from the type, but the abdominal segments were typical. In fact, the whole of these remarkable variations were confined to the head and thorax and their appendages. Perhaps the most remarkable difference occurred in the femora, of which Mr. Heasler had drawn and exhibited a rough illustration, showing in what a marked manner they differed from typical femora, which were not only typical for the genus, but also, so far as he knew, for the whole of the British Geodephaga. The femora were also flattened on both the upper and undersides, and both surfaces were striated transversely. Mr. Heasler read the following notes on the species:—"This species, in common with other members of the genus, has carnivorous habits, feeding on small insects, found on the trees which the *Dromius* frequents. It is a nocturnal species, hiding in crevices of the bark by day, and feeding during the night. It hibernates under bark during the winter, in company with many other insects, which are always found in similar situations. Bearing in mind that the species is under bark quite six months of the year (Oct. to March), and also that there is in company with it a large quantity of insects which might become its natural food, and that nowhere else would it find food so readily during this time of year, it is quite possible that under these conditions the habits of the species might gradually become changed, so that the species became exclusively a sub-cortical feeder. The tendency to a change of habit like this would, I think, be accelerated in

England by the mild winters that we usually experience, and which would tend to shorten the hibernating period of a species, especially with food so close at hand. Under these conditions, it is evident that if a flatter variety occurred with more powerful legs, it would have a good chance of obtaining food that was beyond the reach of its less specialised neighbours, and it is precisely these variations which are shown in the specimen exhibited, so that in spite of the abnormal shape of the femora, I cannot think that it should be classed as a monstrosity, but rather as an important variation, which in time may become a permanent and distinct species. The great difficulty is, that at present the specimen stands quite alone, and all the other specimens I have seen, show no tendency to vary in any one of the points in which this specimen shows so striking a divergence from the type."

March 2nd, 1897.—EUROPEAN AND AMERICAN LEPIDOPTERA.—Mr. Dadd exhibited *Nemeophila plantaginis* (♀ with red hind-wings); *Zygacna pilosellae*, *Z. trifolii*, *Z. jilipendulæ*, from Saxony; *Anosia archippus* and *Limenitis disippus*, to show mimicry; *Agrotis campestris*, *A. quadridentata*, *A. messoria*, *A. venerabilis*, *A. introferus*, *A. agrestis*, *A. insignata*, *A. subgothica*, *A. clandestina*, from Dakota, U.S.A. COENONYMPHA TIPPHON var. INORNATA.—Dr. Buckell, exhibiting as a visitor, showed specimens of *Coenonympha inornata*, on which he read the following notes:—"In the paper on *Coenonympha tipphon*, which I read here in Oct., 1895 (*Ent. Rec.*, vol. vii., pp. 100-107), I alluded to the American butterfly, described by W. H. Edwards, under the name of *C. inornata*, which he and Scudder considered to be a distinct species, but which the late Jenner Weir looked upon only as a variety of *C. tipphon*. My paper was read by Mr. James Fletcher, of Ottawa, the entomologist to the Dominion of Canada, and he very kindly sent me the five specimens of what, as he writes, 'we here call *C. inornata*,' which had been taken in the North West during the summer of 1895, and which I exhibit this evening. In the right-hand column, I have placed some specimens of the Scotch form of *C. tipphon* var. *laidion*, and may just remind you that the characteristic mark of this form is the obsolescent condition of the ocellated spots on the underside of the hind-wing. Comparing the two insects, the American specimens have a brighter coloration on the upper surface, and the hind-wings are very little, if at all, darker than the fore-wings, whilst in the Scotch specimens they are distinctly darker. On the under surface of the fore-wings it is noticeable that the apical ocellated spot is much more developed in the American than in the Scotch specimens. The marked feature of the under surface of the hind-wings is the entire absence of ocellated spots in the four upper specimens; on the lowest there is just a trace of one. In four of the Scotch specimens there is likewise an entire absence of ocellated spots. On the whole, I am disposed to adhere to the opinion, that I expressed provisionally in 1895, that *C. inornata* is not sufficiently different from *C. tipphon* var. *laidion* to be worthy of a varietal name." HEREDITY NOTES ON AMPHIDASYSTRATARIA.—Mr. Bacot exhibited 122 specimens of *Amphidasys strataria*, bred during 1896 from the ova of a ♂ and ♀ of one of his '95 broods. He also exhibited the '95 brood, together with its parents, which were bred from larvæ beaten in the New Forest in 1893. The '96 brood consisted of 58 ♂s and 64 ♀s, or 47·54% ♂s and 52·46%

♀ s. Mr. Bacot read the following notes on his exhibit:—"The variation of the specimens is not very marked, and can, I think, in every instance be traced to one of the parents or grandparents. It consists chiefly of minor details of marking, and the amount of dusky suffusion on the white ground of the fore-wings. Only one point is perhaps worthy of special mention. I refer to a tendency in some of the ♀ s, for the dark bands on the fore-wings to close together at the base. The larvæ of both '95 and '96 broods were fed on cherry, and those of the grandparents on oak." **LARVÆ OF ORGYIA GONOSTIGMA.**—Mr. Burrows exhibited (a) larvæ of *O. gonostigma*, hatched July, 1896, hybernated in bag out of doors on oak; (b) ditto, a full generation ahead, hatched Sept. 1st, 1896, hybernated indoors. **THE WINTER HOME OF APAMEA OPHIOGRAMMA.**—A single larva, believed to be that of *A. ophiogramma*, was also exhibited by Mr. Burrows. It was embedded in the root-stem of striped grass. **DOUBLE-BROODS OF O. GONOSTIGMA.**—With regard to the double-broods of *O. gonostigma*, Mr. Burrows said, in 1887 the imagines emerged on June 28th, the ova hatched on July 18th, and the larvæ pupated on Aug. 30th. In 1893, the imagines emerged on June 14th, the ova hatched on June 27th, the larvæ pupated on Aug. 13th, the imagines again emerged on Aug. 25th, and the ova again hatched on Sept. 15th. In 1896, the imagines emerged on June 22nd, the ova hatched on July 2nd, the larvæ pupated on Aug. 3rd, the imagines again emerged on Aug. 15th, and the ova again hatched on Sept. 1st.

CAMBRIDGE ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.—Feb. 25th, 1897.—**STRIDULATORY ORGAN IN THE LARVA OF GEOTRUPES.**—Dr. D. Sharp exhibited a larva of one of our common *Geotrupes*, and called attention to its stridulatory organ, in which one pair of legs work upon the pair in front of them. He said that this beetle in the imago state also possesses a stridulatory organ, but it is situated in a different position anatomically, and therefore not corresponding with the larval organ. The latter is lost in the imago, and it is clear that this elaborate structure exists solely for the larval state; but Dr. Sharp acknowledged that he was unable to guess what use such a structure could be to a larva, leading as this does an underground life, and having, as far as we know, no relations with the lives of other individuals of its own species that could be influenced by any sound it might make. March 12th, 1897.—**TERMITES.**—Dr. Sharp, exhibited on behalf of Dr. Haviland, part of his magnificent collection of Termites. His method of preparation consists in placing the various forms of a species found in one nest, in glass tubes, divided into compartments by cotton wool, and filled with spirit. A photograph of a Termitarium of *Termes malayanus*, taken *in situ*, after it had been sectionised, showed the royal cell in the middle of the structure, and the chambers for growing fungi—this species being a fungus grower—about the periphery portions of this nest, and individuals taken from it, were exhibited. The nest is composed of thin, fragile laminae, of a pottery-like structure; but the royal cell, composed of this substance, is very thick and solid. The fungus chambers are not constructed of clay, but of comminated vegetable matter, subsequently cemented together. The specimens taken from this nest included two queens and one king from the royal cell, large and small soldiers, and large-headed and small-headed workers.

The Entomologist's Record AND

JOURNAL OF VARIATION.

VOL. IX. No. 5.

MAY 15TH, 1897.

Lycæna arion in the Cotswolds.

By JOSEPH MERRIN, F.E.S. (Author of *The Lepidopterist's Calendar*).

Insects, like mankind, are generally esteemed in proportion to the interest they excite. This interest may be aroused by a variety of circumstances, in which strangeness, ingenuity, rarity and beauty play, perhaps, the most conspicuous parts. To the exhibition of most of these *L. arion* may well lay claim. Happily, in the wordy war of nomenclature, our Large Blue has been spared the tyrannical rechristening to which many of her relatives have been subjected, to the confusion of the tyro, the horror of the veteran collector who has, perhaps, just finished the arrangement of his treasures, and the regret of many a student anxious to learn more of things than of words. How we old "Entos." love these charming classical names. Besides their Attic flavour, they have the charm of long companionship, and we find a difficulty in calling upon our memory to recognise the change to a name which some ancient brother of the net gave to the species a few years before the generally accepted title was substituted.

Leaving this argueable topic, we will mount some of the Cotswold Hills, in the neighbourhood of Gloucester, which we shall find well charged with the saline aroma born of Atlantic breezes. These hills, which extend in a broken line from Dorset to Yorkshire, are capped at their highest points, between 800 and 1,000 feet above the sea, with the Great Oolite formation. The hills of the Middle and Lower Oolite, however, are the most interesting, from the number of plants and insects they produce. Many of the hills present wide, bare stretches of short or rough grass, with tufts of vetch, thyme, etc., stone walls taking the place of hedges, with woods of beech, larch, etc. It is about the middle of June, and, assuming the season to be an average one, we may possibly succeed in having an interview with *L. arion*. I have taken it in at least half-a-dozen different localities on the hills, many miles apart; and its wide range, in many instances, "far from the haunts of men," strengthens the hope that it may be long before it is hunted to extermination. One of the many wonders of insect life is the punctuality in point of time with which some species assume the perfect state; but the temperature of the prevailing season has to be reckoned with. I began taking *L. arion* towards the end of the "fifties," when the seasons seemed generally more productive than they have been in recent years. I have taken it

as early as the 7th June, and as late as the middle of July, in fair order, the bright, warm weather before and after emergence doubtless being a leading factor in the variation.

But, surely, in such a wind as catches our breath on this stony ridge we shall not even see, let alone catch, our Large Blue. Step down among the *débris* of the deserted quarry hole, and lie *perdu* for a time. *Pyrausta purpuralis*, *Ennychia anguinale*, or *E. cingulalis*, you will, by sharp watching, see popping from flower to flower; *Acidalia ornata* may be awakened from her nap in the coarse grass, and the Common Blue may seek refuge from the buffeting winds in the friendly hollows of the rough ground. Then, if you are lucky, *L. arion* may come sailing along, and dip down among the tall grass. Let it settle, and note its spotted beauty as the slender mast of grass it holds by bends with its light weight in the breeze. If the time is late in the afternoon, our friend may select the grass stem that suits him best for his night's lodgment, and like the common blues, who have already gone to roost, with their heads downwards on the shorter stems, he, too, may settle down for the night. He has probably flown many miles during the day, and the slanting sunbeams from the west light him to his well-earned rest; while the wind plays an Æolian lullaby to the hundreds of winged things that seek repose and safety from their enemies. Though a storm of rain may rush along, and lightning even blaze its terrors forth, all the curious centres of life nestling on these apparently inhospitable hills, instinctively hold on to their bending couches, while the rain-drops fall over them harmlessly. The ruby-eyed moth may pay a flying visit in "the glimpses of the moon" to the scented grass-flower, or the small thyme-cups, but he soon passes on to gayer flowers. All the buzzing and bustling community remain quiescent, until the morning sun sends its message of light and warmth, and life once again startles the sweet silence of the time.

Now we visit our most promising spots two or three weeks later. The weather is hotter, and only a female *L. arion* or two are seen flying from clump to clump of thyme. As they rest on the flowers their jagged wings are conspicuous from their shabbiness. Closely watch them, and they will be seen to "mean business." Note the spray of thyme they have just rested upon, and when they have left it crouch down and examine it, and a little white egg will be found to have been deposited near the base of a tiny blossom. I have watched this process go on repeatedly, and have gathered many sprays of thyme, each with its white egg. Anxious to work out the larval life-history of the species, I have dug up clumps of thyme and sent them, or sprays containing eggs, to the late Messrs. Newman and Buckler, Mr. Porritt, and others; but, as stated in Newman's *History of British Butterflies*, none of us got beyond a sight of the small pinkish larva, which emerged, and after feeding a short time entered on the dangerous career of hibernation, and speedily disappeared, whether from the visit of some voracious enemy, or the absence of alternative food-plants, no evidence was forthcoming. Marked clumps of thyme, containing eggs, left undisturbed on the hills, I found to be equally tenantless of larvæ in the spring. Further searching in this direction may, however, lead to better results. Many entomologists have come from London and other distant places to capture the species, with

more or less success, and some few dealers and young amateurs have, perhaps, in some years, been over-anxious to fill their boxes. So scarce did the species become at one time, that the late Prof. Harker read a paper before the Cotswold Naturalists' Field Club, on its "extinction" from the Cotswold district. I was invited to the meeting, and expressed the opinion that it was not extinct, and my prophecy has proved correct, for it has been taken, or seen, with a few exceptions, nearly every year since that time, though sometimes only singly. Other causes than over-catching have, it is pretty clear, been at work to deplete the species. The original locality, near the Roman entrenchments, has been completely cut up by timber hauling and quarrying, to say nothing of excessive grazing and golfing. The disappearance of local species occurring in the Cotswold district is not confined to *L. arion*. For many successive years several species were plentiful which now are rarely seen. The pride of having long series has, perhaps, something to do with the desire to catch large numbers of particular species. If collectors could be induced to be content with, say a male and female as types of a species, only adopting the long-series system in the case of variable kinds, I think the persistency of rare and local species might be prolonged in many localities. After all, there may be occult influences at work to increase or diminish particular kinds, which we have not yet been able to discern.

Notes on the Zygænidæ.

II.—HISTORY OF *ZYGÆNA HIPPOCREPIDIS*, ST., AS A BRITISH SPECIES.—*Z. HIPPOCREPIDIS*, WOOD.—*ZYGÆNA HIPPOCREPIDIS*, ST., PROBABLY A HYBRID FORM BETWEEN *Z. TRIFOLII* AND *Z. FILIPENDULÆ*.—GENERAL RECORDS REFERRING EITHER TO *Z. HIPPOCREPIDIS* OR THE PARALLEL ABERRATION OF *Z. FILIPENDULÆ*.

(Continued from p. 87).

By J. W. TUTT, F.E.S.

It may now be advisable to give a brief summary of what I have been able to glean concerning *Zygaena hippocrepidis*, St. This species, it need scarcely be said, is not the *hippocrepidis* of Hübner and Ochsenheimer, which is generally accepted as a var. of *Z. transalpina*, nor is it *Z. ochsenheimeri*, Zell., which I have shown (*Notes on Zygaenidæ*, pp. 19–21) to be an Alpine species. Stephens separated this species from, and compared it with, *Z. filipendulæ*. He captured it first in a field near Coombe Wood, in June, 1810, and subsequently near Darenth Wood. He describes it as varying in size like *Anthrocera filipendulæ*, "which it greatly resembles, but the border of the posterior wings is considerably more distinct than in that insect, and undulated internally; the sixth spot on the anterior wings (the one towards the anal angle) is generally small, with a coloured nervure passing through it; the under surface of the anterior wings with the disc entirely red, and the maculations not defined. Above, the anterior wings are blue-black with six red spots, disposed as in *A. filipendulæ*, and the posterior wings red, with an undulated greenish-blue margin; the abdomen immaculate" (*Illus. of Brit. Entom.*, i., p. 109). Stephens further describes a yellow-spotted form of this species (three specimens of which he bred) from the neighbourhood of

Darenth Wood. Wood (*Ind. Ent.*, iv., fig. 6) figures the yellow form under the name *hippocrepididis*, and gives the species as occurring in Middlesex, Surrey and near Coombe.

Writing of the early form of *Zygæna trifolii*, which appears "from the second week of May until the second week in June," T. H. Briggs says:—"I have nearly always found this insect in company with *Z. filipendulæ*" (*Trans. Ent. Soc. Lond.*, 1871, pp. 422-423). He further states:—"On June 16th, 1864, I found *Z. trifolii* in abundance in some rough dry fields, abounding in *Lotus corniculatus*, bordering on Barnwell Wold, Northamptonshire; the insects were very much worn, of a very small form, in fact, types of the 'early' *trifolii*. *Z. filipendulæ*, which also occurs there, was just coming out." Again he writes:—"On June 16th (1871), at Folkestone, *Z. filipendulæ* larvæ swarmed in the warren, but no moths could I find. On Castle Hill, the moths were out, but they were very small, and with a tendency to the obliteration of the sixth spot; antennæ shorter than usual; one specimen, a ♂, is of the size, contour, and has the broad black border to the hind-wings, of the early *trifolii* found at Folkestone, which was out. Surely these were hybrids?" (*Ibid.*, p. 429).

In 1874, Richardson records that "in a field sheltered by woods, and in a low situation, about four miles from Winchester, he took, on June 9th, two specimens of *Z. filipendulæ* . . . in company with *Z. trifolii*." At this time, he adds, "*Z. filipendulæ* (which is common on many of the downs in the neighbourhood of Winchester) had not there even assumed the pupa state, nor did it begin to do so for some time after this date. The first imago I saw on the downs was on July 10th, just a month after the appearance in June" (*Entom.*, viii., p. 21). In 1882, Briggs records the fact that Weston had a splendid series of *Z. filipendulæ*, in which the sixth spot is only faintly traceable, from Tilgate Forest, many of them bred, and that he had taken a similar variety at Folkestone. The Folkestone specimens, however, "not only appear early in June, before the majority of *Z. filipendulæ* are out of the larval state, but are smaller and have the border of the hind-wings broader than the Tilgate specimens, especially in the females, and I have been somewhat inclined to regard them as hybrids between *Z. trifolii* and *Z. filipendulæ*. It was a curious circumstance that Weston's specimens were from a part of the Forest where for several years I had taken the large marsh form of *Z. trifolii*, but had never seen *Z. filipendulæ* in any of its stages" (*E.M.M.*, xix., p. 43). In 1885, Boden writes that he has taken, in the metropolitan district, for several years, a *Zygæna*, for which he could never find a name. It differed from typical *filipendulæ* in "that the spot near the centre of the costa, and the one nearest the tip, are much smaller than in the type; also the green nervure cuts through the spot nearest the tip; and, what is more striking, it has a broader border on the under-wing. The time of appearance is much earlier than that of *Z. filipendulæ*, as I generally take it in May" (*Entom.*, xviii., p. 317). In 1890, Robertson writes that, in early June, in the neighbourhood of Swansea, he "came across *Zygæna trifolii* and *Z. filipendulæ* in the same field, which was a boggy sort of place. All were more or less worn or faded, though, oddly enough, the males of *Z. trifolii* were in moderately good condition, while the females generally were *passée*" (*Ent. Record*, i., p. 205). Weir, in his presidential address to the

members of the South London Entom. Society, 1893, says:—"In nature, I have observed and taken hybrids between *Anthrocera filipendulæ* and *A. trifolii*. These are gregarious species, and it is in certain localities only that flocks of the two are found in company. My experience of more than fifty years' collecting on the South Downs is that *A. filipendulæ* only occurs on those chalk-hills; but in the Weald of Sussex, the two species are often found together, and from the experiments made by Mr. Fletcher, it appears that hybrids are easily obtained between them in confinement" (*Proc. Sth. Lond. Ent. Soc.*, 1893, p. 92). In 1892, South writes that, on June 11th, in a meadow about half-way between Rickmansworth and Northwood stations, "*Ino statives*, *Zygæna filipendulæ* and *Z. trifolii* were all out," and that he "secured some nice specimens of each of the latter, including two examples of the confluent form of the last-named species. Both species were flying together" (*Entom.*, xxv., p. 173). Barrett writes:—"Weir has met *Z. filipendulæ* paired with *Z. trifolii* in damp meadows" (*Brit. Lep.*, ii., p. 137).

In March, 1893, I stated that "in a certain field in Kent, some ten years ago, what is known as the small form of *Zygæna trifolii* was taken very abundantly during the first week in June. These specimens were very characteristic, many of them being strikingly blotched; but occasionally an odd specimen was taken with six, instead of five, spots on the fore-wings. The species afterwards got very rare, and of the specimens captured, at least 50 per cent. had six spots, although still retaining the small size and general characters of the old five-spotted form. Two of the five-spotted specimens captured in 1892, had their fore-wings taken off, and their bodies forwarded to Mr. Pierce, of Liverpool, who examined the genital organs, and returned them as undoubted *Z. filipendulæ*. Knowing their history completely, I felt satisfied that these represented the development of a race of six-spotted *Z. trifolii*." "There were," I said, "two suggestions open: (1) that we have a separate species occurring in late May and early June, distinct from both *Z. filipendulæ* and *Z. trifolii*, which (like some of the Continental species) may be either five- or six-spotted; (2) that *Z. filipendulæ* and *Z. trifolii*, although distinct enough in most localities, are, in others, in such a transition state that they have the inherent ability to change from one form to the other under certain conditions. The ease with which Mr. Fletcher had hybridised the species seems to point to the latter as a more probable conclusion." I then added that "both typical *Z. loniceræ* and *Z. filipendulæ* occur in the immediate neighbourhood, but that the former rarely appears until the form described above is well over, whilst the latter is also a week or two behind *Z. loniceræ*" (*Trans. Ent. Soc. Lond.*, 1893, p. x). Paying particular attention to the form, which was well out at the end of May, 1893, I observed that out of about two hundred specimens taken, five only were absolutely typical, the remainder having a tendency to assume a six-spotted form, these, in most cases, being well marked and similar to *Z. filipendulæ* (*Proc. Sth. Lond. Ent. Soc.*, 1893, p. 119). At the meeting of the South London Ent. Soc., January 10th, 1895, in a discussion following Mr. Tutt's account of a six-spotted race of *Zygæna*, having during the last fifteen years almost superseded a family of the early *Z. trifolii* in North Kent, "several members gave

instances of a small six-spotted *Zygaena* being taken in early June in various localities." These references, which have come to hand without much trouble and I feel certain by no means exhaust the records, refer exclusively to the occurrence of the early six-spotted *Zygaena* (described by Stephens as *hippocrepidis*), with the early five-spotted *Z. trifolii*.

There are now two or three records so general in their nature as to be almost useless for any scientific purpose, which may or may not refer to the *hippocrepidis* of Stephens, or to the parallel aberration of *Z. filipendulae*. The dates of the captures, and other particulars, would have made the records valuable. In 1882, Barrett records that two very interesting specimens of *Z. filipendulae* were exhibited at a meeting of the local (Pembroke) Field Club. "In one of them the posterior (or sixth) red spot on the anterior wings was entirely absent, and in the other only faintly traceable, so that both might easily have been passed over as 'five-spotted.' They have, however, the very narrow blue-black border to the hind-wings, and the form and general characters of *Z. filipendulae*, and were reared with a number of ordinary examples of that species from cocoons found in one of the hollows of the coast-cliffs, where no other species of *Zygaena* is found" (*E.M.M.*, xix., pp. 21-22). Commenting on this, C. A. Briggs says:—"I have always been somewhat inclined to look on these forms as hybrids between *Z. trifolii* and *Z. filipendulae*, and should, therefore, have expected to find that *Z. trifolii* occasionally occurs on the summit of the cliffs to which Mr. Barrett alludes, but, either from its early appearance, or from the summit not being so much worked, had been overlooked. The aberration in which the sixth spot is entirely absent is far the scarcer, and as, so far as my experience goes, it is confined to the female specimens, it would be interesting to know whether the specimen referred to by Mr. Barrett is a female or not. In the specimens I have seen, the absent spot is always to be found on the under-side, so, beyond the question of hybridism, no doubt as to identity exists" (*E.M.M.*, xix., p. 48). In 1888, Meyrick writes that, at Marlborough, "a colony of *Z. filipendulae* frequenting a small patch of heath, was remarkable, in that the sixth spot of the fore-wings was, in fully three-fourths of the individuals, greatly reduced in size, sometimes, indeed, so inconspicuous that it might well have been passed over as absent. As, in the other fourth, the spot was of its usual size (with connecting links), and as there appears to be no other definite difference between the forms, I suppose we have here a case of an individual variation becoming prevalent through isolation; or might the colony possibly have been crossed with one of the five-spotted species? I observed no specimens showing this variation among other colonies in the district; and where the species are so little defined as in this genus, it appears worthy of record" (*E.M.M.*, xxv., p. 184). In the report of the exhibits of the City of Lond. Ent. Soc. for February 21st, 1893, we read that Mr. J. E. Robson exhibited specimens of "*Zygaena filipendulae* with five spots on the fore-wings" (*Ent. Rec.*, iv., p. 125).

As I said at the commencement of this paper, these remarks are purely tentative, and written with the view of obtaining some exact observations on these species. We do not want opinions, nor generalisations (except from those who capture both forms), as neither

will add to our scientific knowledge, but only increase the doubt at present existing. (*To be continued.*)

[NOTE.—So far as Mr. Hewett's paper is a criticism of our own writings on this subject, we have taken the liberty of explaining the differences of opinion we seem to hold by means of a series of brief footnotes. We are sure our readers will prefer this to another paper on a subject which successive communications seem as yet to push no more forward.—ED.]

Are *Tephrosia bistortata* (*crepuscularia*) and *T. crepuscularia* (*biundularia*) distinct species? *

By WILLIAM HEWETT.

The burning question of the hour among some British lepidopterists appears to be whether, in *T. bistortata* and *T. crepuscularia*, we have two distinct species, or merely a species and a well-marked variety? Many competent authorities—Doubleday, Guenée (? Ed.), Adkin, Tutt, Fenn, Jones (A. H.), Prout, Robertson, Sheldon, Riding, Hamm, Mason (J.), etc.—incline, or have inclined, to the former belief, others—Zeller, South, Meyrick, Barrett, Bignell, Smallwood, etc.—to the latter.

Staudinger, in his *Catalog*, shows two species, but, from the “?” placed in front of *T. crepuscularia* (*biundularia*), it is evident that he entertains some doubt. Kane states that he has “an open mind on the question.”

It will be observed that (almost without exception) all those gentlemen who, themselves, have observed and taken both *T. bistortata* and *T. crepuscularia* are unanimous in considering the insects to be two species. Most of those who believe them to be one species, either have their information second-hand, or else appear to have personal experience of one species only, viz., *T. crepuscularia* (*biundularia*).

It may be well if I state at the outset what my ideas of a species are. I consider the terse definitions of the term “species,” as given by the botanist, De Candolle, and by the zoologist, Swainson, and set forth by Wallace (*Darwinism*, p. 1), to be a satisfactory interpretation. Wallace writes:—“The term ‘species’ was thus defined by the celebrated botanist, De Candolle: ‘A species is a collection of all the individuals which resemble each other more than they resemble anything else, which can, by fecundation, produce fertile individuals, and which reproduce themselves by generation in such a manner that we may, from analogy, suppose them all to have sprung from one single individual.’” The zoologist, Swainson, gives a somewhat similar definition: “A species, in the usual acceptance of the term, is an animal which, in a state of nature, is distinguished by certain peculiarities of form, size, and colour, or other circumstances, from another animal. It propagates, ‘after its kind,’ individuals perfectly resembling the parent. Its peculiarities, therefore, are permanent.” Absolutely there is no such thing as a species in science. It is only a term for an arbitrary group. The information I have been able to collect from various collectors covers 20 English, 13 Irish, 4 Scotch, and 2 Welsh counties.

* Abstract of a paper read before the South London Entomological Society Jan. 14th, 1897.

In the *Tephrosia* controversy of 1886 (*Entom.*), Mr. Smallwood considers the double-brooded *T. bistortata* to be an exclusively southern insect, and I agree with him, as I have utterly failed to obtain any reliable evidence of this species occurring in the north of England,* the Midlands, Ireland, Scotland,** or North Wales. Mr. Tutt, speaking of the date, May 2nd, as given by Mr. Harrison for *T. crepuscularia* (*biundularia*) in Yorkshire, says, "he has information that the insect occurs there generally some three or four weeks later, and that only in early seasons is it found at such an early date." That *T. crepuscularia* occurs later than May 2nd, in Yorkshire, is quite correct, but that it also occurs very much earlier, no matter what sort of season, is also correct, viz., Doncaster, middle of April, 1893 (Corbett); Rotherham, "end of March" (Young); Skipwith, "April 29th and 30th, 1895" (Ash); Barnsley and Doncaster, "May 2nd and 9th" (Harrison); York, "April 4th and 10th" (Hewett).*** Mr. Tutt, further commenting on Mr. Harrison's specimens, says:—"I am not surprised that a second brood does not occur in the Barnsley district, as the species obtained there is *T. crepuscularia* (*biundularia*), the single-brooded species," and states further:—"There seems little doubt there is only one species obtainable there." I am quite agreed with Mr. Tutt that only one species (*crepuscularia*) occurs in the Barnsley and Doncaster districts, and, further, I am quite convinced that only this species occurs in Yorkshire, although Mr. Tutt, writing to Mr. Young about some specimens afterwards sent to him, stated that there were both *T. bistortata* and *T. crepuscularia* among them, and, in a letter to me, dated April 23rd, 1896, says:—"I have a specimen which Mr. Harrison sent me years ago with a lot of *T. crepuscularia* (*biundularia*), which I believe to be the earlier species, although we expect in closely allied species occasional parallel variations, which this may well be." I add to this—undoubtedly is.†

Mr. Smallwood (*Entom.*, 1886, pp. 266-268) says:—"I am convinced that any definite difference will be found, if at all, in the ova." Dr. Riding states that the eggs of the first brood of *T. bistortata* are larger than those of *T. crepuscularia*.

I must confess, on first reading Mr. South's opinion (*Entom.*, 1886) that "the first of these broods (*bistortata*) cannot be other than an

* Compare Porritt, *List of Yorkshire Lepidoptera*, p. 35, and *Ent. Rec.*, viii., p. 286; ix., pp. 28-29.—Ed.

** We do not quite see how these occasional early occurrences affect the general statement. From Mr. Hewett's own Yorkshire notes we take the following facts:—"I have visited Edlington in March and April, but have never seen a *Tephrosia*. My first dates are:—1871, May 19th; 1873, June 12th; 1874, May 10th; 1875, May 9th; 1876, June 6th (up to June 24th); 1877, May 22nd; 1880, May 2nd (plentiful on June 5th); 1881, May 23rd; 1884, June 6th; 1887, June 7th (plentiful on 17th); 1888, May 26th (plentiful on June 13th and 25th); 1890, May 26th to June 5th; 1891, June 12th; 1892, June 6th; 1893, May 9th-12th; 1894, June 18th; 1895, May 24th."—J. HARRISON, *Sept. 14th, 1896*. Then we read:—"I have taken *T. biundularia* as early as March 2nd, and as late as July 29th but my observations lead me to believe there is only one brood in this (Edlington) district It is at its best from about the middle of May to about the first ten days in June."—J. N. YOUNG, *Sept. 18th, 1896*. Again we find:—"I generally get *T. biundularia* about the middle of May."—H. H. CORBETT, *Sept. 28th, 1896*. Surely this information bears out our statement.—Ed.

† As Mr. Hewett had never seen the specimen, which has been repeatedly exhibited, this positive remark must be considered simply as a pious opinion, based on entire ignorance of the specimen.—Ed.

earlier emergence influenced by climate in the first instance, and perpetuated by inheritance, etc.," that I thought he had found the correct solution of the phenomena; but how is it that *T. bistortata* has not ousted, or is not ousting, *T. crepuscularia* in the Southern counties? Mr. South says it has been brought about by favourable environment and climate, but these have not altered in Somerset, Berks and Kent, for long periods. Therefore, *T. bistortata* ought, long ago, to have supplanted *T. crepuscularia* in the South, but it has not. The two exist together, and there are no signs of the favoured variety (= *bistortata* according to South) supplanting the original form (= *crepuscularia*). Yet this process is occurring in Yorkshire and Cheshire, according to Mr. Arkle and my own observations, where the ab. *delamerensis* is gradually supplanting the pale form of *T. crepuscularia*. Again, if *T. bistortata* be a variety, it must have been crossed now and again by the parent (*crepuscularia*) form, when the dates of emergence permitted, and many intermediate forms ought to be constantly taken in Somerset, Berks and Kent. Yet we know such specimens are not taken. Then, again, why should altered colour and facies occur together with a shortened pupal stage in a variety? The same causes would be acting on the parent form at the same time in the same localities (as they exist together). Why should not the parent form also alter the length of its pupal stage like the so-called variety? Why should not *T. crepuscularia* emerge in March in the south of England, if *T. bistortata*, its supposed variety, does so? Then, again, is there any record of a variety of any other insect that has ever been supposed to have similarly altered its time of emergence?

Mr. Tutt (*Ibid.*, p. 304), in some remarks on what constitutes a species, says:—"The important factor to me seems to be, will the individuals copulate freely in a state of nature* to propagate their own particular kind? If so, however variable the forms may be, I think it is generally recognised that the progeny form but one species." He further enquires whether Mr. South, or any other observer, ever saw, in nature, an undoubted specimen of the early species (*bistortata*) in copulation with an undoubted specimen of the later species (*crepuscularia*). That freshly emerged *T. bistortata* and *T. crepuscularia* will not copulate has never been proved. On the other hand, I think it highly probable that, under favourable circumstances, they would pair, and that their hybrid offspring would prove fertile.† If Messrs. Butler, Hamm, Robertson, Vivian, Studd, A. H. Jones, or Fenn, who obtain *T. bistortata* in April, will retard the emergence of some of their specimens, obtainable after the middle of April, I would endeavour to pair them with some of my earliest *T. crepuscularia*, or I would send the latter, in order that they might attempt to cross them with *T. bistortata*. I would also suggest the importance of obtaining reciprocal crosses.

(To be continued.)

* It is most important that this should be in a state of nature. Many species hybridise when confined artificially.—ED.

† These insects have since been paired by Dr. Ridg and Mr. Bacot, in confinement, but it proves little: *Teste*, *Smerinthus ocellatus* + *S. populi*, *Amphidasys strataria* + *A. betularia*, *Zygæna filipendulæ* + *Z. lonicerae*, etc.—ED.

Hydriomena furcata (Hypsipetes sordidata): Its Synonymy, Variation, Geographical Distribution and Life-history.

By LOUIS B. PROUT, F.E.S.

(Concluded from p. 87.)

Geographical Distribution.—As with so many of our common moths, this is very extensive, though it cannot actually be considered a cosmopolitan. Staudinger gives Northern and Central Europe, Iceland, Piedmont, Ural, Altai and Amur; to which must be added, after Packard, an extensive range in North America. The aberration *fusco-undata*, and the variety (et ab.) *infuscata*, are apparently chiefly boreal or mountain forms. Staudinger specifies England, Switzerland, Iceland, etc., for the former, Northern England and Iceland for the latter.

That this is essentially a northern species, nearly all my available information goes towards showing. Staudinger tells, in the *Stettiner Entomologische Zeitung* (1857, p. 263), of its abundance in Iceland, and the Scandinavians write of its abundance in Norway, etc. In some parts of Scotland, at least, it appears to be in boundless profusion. My friend Mr. J. P. Mutch was quite recently telling me of the swarms met with during his summer holiday in the North, while hardly anything else was to be found. But it seems to be more or less common over nearly the whole of the British Islands.

On the Continent, however (even in Germany, for example), I read that it is more local, though still abundant in places, and as one proceeds further south it disappears altogether.

My notes on the life history of this species will, I am afraid, be very fragmentary, but I shall at least endeavour to be accurate. Newman (*British Moths*, p. 153) has a circumstantial account which, alas! (like only too many of Newman's "circumstantial accounts") is largely apocryphal. As the work is readily accessible, it is needless to quote; but I may point out that I knew long ago—and many of my audience must have known long ago—that it does not hibernate "half-grown," for we find it extremely small when working fallows at the beginning of April. But as Newman seemed so well acquainted with his subject, I felt loth to accuse him of any serious error, and assumed that possibly the larva hatched in autumn and laid up for hibernation very early. Two sources of doubt, however, presented themselves: 1st, the well developed ovipositor of the female, which I thought ought to indicate some more secure concealment of the eggs than would be necessary if they were to hatch "in twelve days;" and, 2nd, the entire change of habit of the larva which would be necessitated in the spring, when it took to its concealed mode of life, as compared with the open feeding on mature fallow leaves, which was assumed for the autumn. I therefore pill-boxed two females for ova during my recent sojourn at Sandown. The eggs obtained, of which I shall speak in further detail immediately, appeared fertile, but have not yet hatched, and I have since found that Dr. Rössler, in *Die Schuppenflügler*, indicates the egg as the hibernating stage.

THE EGG.—This is probably laid in crevices of bark, or some similar situation, in July, August, or even the beginning of September. In captivity this species does not seem disposed to lay so readily as most of the *Larentiidae*; at least, my females only laid respectively two

eggs and one—the former concealing them under loose wood in the chip box, in what I take to be, more or less, the normal way. When laid, the eggs are whitish; in two days they begin to change to a fleshy shade, which gradually deepens in intensity; in another eight days they become grey, gradually deepening in two days more to deeper blue-grey, which should (by analogy with other Larentiid eggs) be their final colour, and in which condition they still abide. I rather suspect the larva is developed within the egg-shell.

THE LARVA.—I have never had the newly-hatched larva, and have made no description of the larval stages. I do not recollect that it undergoes any important changes in coloration or markings, nor do I consider it variable on the whole. I may refer you to Newman for a description of the full-fed larva. I am not disposed to agree with that author, that it “grows very rapidly.” Of course, I assume that the comparative adverb, “rapidly,” is to be taken with reference to other Larentiid larvæ. If he is comparing its growth with that of a man, or of a cedar tree, I have no fault to find. I have, unfortunately, no notes on the subject, but I am certain the normal larval period cannot be much under two months; and as the growth is very irregular, some of the larvæ would no doubt take a great deal longer. Surely this growth is not “very rapid,” when compared with *Melanippe fluctuata*, *sociata*, *galiata*, *Anticlea rubidata*, *Coremia designata*, etc., etc., all of which, in my experience, can go from egg to pupa in about three weeks. As regards the food-plants of this species, it is a fairly general, yet by no means an absolutely indiscriminate, feeder. The lowland forms usually feed on willow, poplar or nut; in confinement they will, of course, accept any species of poplar. Some of the old Continental works indicate alder, or even birch, as food-plants; but I am not certain whether this has had recent confirmation, and there may have been some confusion with the allied *H. trifasciata*. The moorland forms, etc., have quite different food-plants, namely, *Ericaceae*. In the Yorkshire hillside woods, Mr. Porritt considers that they are confined to bilberry; but the Scottish mountain forms feed chiefly on heath (? *Calluna*), as was first suggested by Mr. Jenner Weir, in vol. xv. of the *Entomologist*, and corroborated by Mr. Hinchcliffe, of Alva, and Mr. W. Reid, of Pitcaple. They ever prefer that food to bilberry in places where both grow together.

THE PUPA.—Treitschke says that this is green, Hübner figures it of a bright red-brown. The latter is correct, and probably Treitschke described from an immature pupa. It is interesting that the colour is quite different from the black pupa of the closely-allied *H. trifasciata*. The Rev. Joseph Greene (*Insect Hunter's Companion*, p. 35) says that the pupæ of the three species of this genus “are all black and very active.” Considering that the pupa is Mr. Greene's speciality, and that he used to find those of *sordidata* “in abundance at the roots of willows,” I am puzzled that he should have described it as black. It is hardly likely that a subterranean pupa would be very variable in colour. I cannot find any entries in my note book as to the duration of the pupal period, but I fancy it is about three weeks, probably a little more in the case of individuals which pupate very early.

THE IMAGO.—This is on the wing for a tolerably long period during the summer months. Dates in my own diary range from May 30th (in 1893) to September 15th (in 1891), but my early dates are only for bred


examples, and I do not think I have met with it at large before the beginning of July; and even in breeding, one does not ordinarily obtain them till about the middle of June—1893 being an abnormal season. In the *Ent. Mo. Mag.*, vol. ii., pp. 90-91 (1865), Dr. Jordan recorded that in Devonshire (Dartmoor, etc.) the imagines from the bilberry-fed larvæ appear a month earlier than those from willow and nut, namely, from the beginning of June. Mr. Porritt tells me that this is certainly not the case in Yorkshire, where both forms appear together in July and early August. Dr. Jordan, in this same note, says that he can detect no difference, either larval or imaginal, between the bilberry and willow forms. I am not aware that any writer has noticed any difference in the larval stage, but certainly the imaginal (as already remarked) shows very decided differences in many localities. As a set-off against these early records of Dr. Jordan's (from the beginning of June), I quote the following instance of late emergence from some brief notes by J. Sparre Schneider, on the entomology of Arctic Norway (*Ent. Tidskr.*, vi., p. 151):—"In 1881, I found a pupa under a stone, 11th September (!), from which the moth emerged the day after, a small and dark, but well developed, ♀." It is to me not conceivable that this species should throw even an occasional specimen of a second brood; and I look upon all late dates as instances of retardation, probably in the time of hatching, or in the rate of progress in the larva, but possibly occasionally also in the development or disclosure of the imago.

As to the resting habits, etc., they probably vary a good deal in the different races. In districts where I have collected, they generally resort to the cover of hedges or bushes. They may be readily disturbed by day by the beating stick, often in great abundance. Like nearly all Geometers, they fly freely at dusk, and they frequently visit flowers, if not also sugared trees. As far as I remember, I have noticed them chiefly at flowers of *Eupatorium cannabinum*.

Notes on the Larva of *Saturnia pyri*.

By J. W. TUTT, F.R.S.

LARVA OF *SATURNIA PYRI*.—The LARVA is of a lovely pea-green colour, rather darker in colour between the sub-spiracular flange and supra-spiracular tubercles; paler (tending towards whitish) between the two rows of dorsal tubercles; a faint and indistinct medio-dorsal line can be discerned on some of the abdominal segments. The HEAD is comparatively small, rounded in shape, but tending towards a trapezoidal form, and slightly notched on the crown; the surface is smooth; the colour green, with a dark red isosceles triangle in the centre of the face, the base of which runs along the upper edge of the mouth, the apex of triangle not quite reaching the furrow dividing the apex of the head; the mouth parts are reddish-brown. The head is retractile within the pro-thorax, the cheeks with a few dark hairs. The upper edge of mouth with a fringe of long whitish hairs. The THORACIC SEGMENTS are deeply cut, and the pro- and meso-thorax are partially retractile. The *pro-thorax*, with two turquoise blue pre-spiracular tubercles elevated on stalks, with seven points round the edge, bearing black hairs, and two central black points also bearing long spatulate hairs. Two compound, similarly coloured, dorsal

tubercles (one on either side of the dorsal line)—representing the combined dorsal and supra-spiracular tubercles of the succeeding segments—being elongated, and not having the special coronal form exhibited by the other tubercles. The prothoracic spiracle, just in front of the segmental incision, is white, oval, with blackish rim. The *meso-thorax* has two large turquoise blue, coronal, dorsal tubercles, with a circle of nine black hairs on the circumference of the tubercle, and each tubercle containing two black points, bearing long spatulate hairs; two supra-spiracular tubercles, with seven black hairs on the circumference, bear one long central spatulate hair; there are also two similar tubercles just above the line of the sub-spiracular tubercles of the abdominal segments; two much smaller turquoise blue tubercles below lateral flange and above true legs. The latter dark red-brown in colour, with yellowish bases. The tubercles of the *meta-thorax* similar to, and agreeing with, those of the *meso-thorax*. The 1st, 2nd and 3rd *abdominal segments* have a similar series of tubercles to those of the *meso-* and *meta-thorax*; but the dorsal with fewer circumferential points, and with only one central hair. The 4th, 5th, 6th, 7th and 8th abdominal segments have similar tubercles, but the sub-spiracular tubercles of the 7th and 8th give rise to more than one central hair; the 9th abdominal segment bears only the two dorsal and two supra-spiracular tubercles of the series. The anal segment is very distinct and separate from the 9th abdominal; it is very flat, and bears a dark red-brown saddle-shaped chitinous patch, the rounded edge of the saddle forming the posterior edge of the flap. The bases of the *anal prolegs* are also provided with somewhat similar smooth, red-brown patches; these prolegs are themselves purplish in colour, with a large velvety black base retractile within the green fleshy bases; the joints are provided with rims of comb-like white hairs. The four pairs of abdominal prolegs are very similar to the anal. (Mr. Bacot observes that the proleg has the -shaped foot that is so noticeable in *Liparis*). A fringe of stout bristles surrounds the vent. A conspicuous pale yellowish-green sub-dorsal flange runs along the first eight abdominal segments, and is broken up into a series of sections somewhat lunular in shape by the segmental incisions—these sections carry the sub-spiracular tubercles. The flange is continued, but less conspicuously, on the three thoracic segments, but its edge is placed just beneath those tubercles, which are almost in line with the sub-spiracular of the abdominal segments. The abdominal spiracles are exceedingly large and conspicuous, and placed in the same line (transversely), as the tubercles. They are white, with very deep red borders. The thoracic segments are sub-divided into three *sub-segments*, the middle subsegment carrying the whole series of tubercles. The abdominal segments are sub-divided into four more or less distinct sub-segments, the tubercles being on the second sub-segment, so that the row of tubercles appears to be rather nearer to the front than to the back of the segment. The ventral area (below the lateral flange) is of a rather darker green than the lateral areas. The segments gradually increase in size from the head to the *meta-thorax*, and the increase in diameter is maintained through the 1st, 2nd and 3rd abdominal segments, and with but very slight decrease to the 7th, the 8th being a little narrower. The *hairs* of the larva are very beautiful spatulate-

looking structures, directly after the last moult, but they soon get damaged and the tips broken off (in captivity, at least). Bacot adds: "Similar hairs arise from the base of some tubercles, and also from the skin surface. There were also some shorter and finer hairs present. There is, further, a coat of very fine hair or down on the larva; I could distinguish this, with an one-inch objective, on the sides of the larva, but am not sure whether it covers the whole skin surface, or only exists in patches. Possibly this may correspond to the short (secondary?) hairs on the shagreen tubercles of *Smerinthus*, etc." The dorsal area becomes orange two days preceding pupation, the spiracular region remaining green. After commencing to spin, the larva rapidly becomes reddish-brown. The individuals described came from Bourg d'Aru (*vide, ante*, p. 54).

Notes on Coleoptera.

BEETLES THAT DESTROY FORESTS (LONGICORNIA).

By CLAUDE MORLEY, F.E.S.

There is no time in the life of a tree at which it is not exposed to the attacks of insects, and Coleoptera do their share of the fighting to some purpose. If the seed escapes from weevils, and germinates, there is the larva of the cockchafer, *Melolontha vulgaris*, ready to bite off the young root; while, at a later period, *Phytophaga* devour the leaves, *Scolytidae* destroy the vital tissue beneath the bark, and various others drive long galleries through the solid wood, permeating it in all directions.

Of the latter class, the *Longicornia* are perhaps the most conspicuous, though, from the fact that they usually prefer decaying trees, they do proportionately little harm. Their place in Nature is that of scavengers of the forest, charged with the task of clearing away the masses of dead and dying trees which would otherwise stifle the newer growth. No sooner does a tree begin to show signs of decay—even such signs as are often imperceptible to us—than it is seized upon by the beetles; long shafts and tunnels are excavated throughout its substance, admitting rain and moisture, which speedily reduce the wood to a pulp, serving only the beneficial part of food for a fresh generation of trees. So is the erstwhile monarch of the forest laid low, and we again realise that "Life springs up from life's decay."

The larvæ of these insects are cylindrical (rarely flattened); the head is large, depressed, and of a horny texture, armed with powerful, wedge-shaped jaws; the meso- and meta-thorax are short, and the nine abdominal segments, sometimes gradually tapering, at others slightly enlarged, towards the anal segment (which is continuous with the body), are each furnished with a patch of corneous scales above and below, and also with fleshy lateral protuberances which serve as organs of locomotion. The galleries seem to be made at random, without any regular plan; but the larva always approaches the surface when about to pupate, in order that the imago, when it emerges, may have no difficulty in effecting its liberation from the pabulum in which it passes the majority of its life. That the larva should thus approach instinctively the surface, without quite touching it, is both curious and interesting, in that it should know in the first place just where to

find the surface, and also be cognisant with the fact that, did it not do so, it would assuredly die, since its jaws in the perfect state are far less formidable than in the larval, and, indeed, these beetles acquire nutriment for the most part by means of the ligula or tongue, rather than by their mandibles. That they can make very good use of the latter upon occasion is abundantly evidenced by their extreme pugnacity, and by the free use they make of these small, sharp jaws upon any less hardy insect that may happen to cross their path—sometimes even upon their own species. I have put a dozen *Saperda populnea* into a large box, and taken only one whole specimen from it an hour later.

Some pupæ, as in *Rhagium*, form a cocoon from chips of wood; this, however, unlike that of *Dicranura*, is of very flimsy consistency, and to take the pupa unhurt from it is a matter of much difficulty; others, as *Saperda*, make a chamber by filling up the entrance with fragments of wood. The pupa is always found upright, that is to say, in a vertical position, as it were standing on its tail, though isolated cases of inversion have been recorded—a constant position almost unique among Coleoptera. One of those species which can be considered as really harmful is *Hylotrupes bajulus*, which is most injurious to posts and rails, but fortunately this species is rare and local. Another, *Saperda carcharias*, is known to destroy young poplars, but, according to some Continental authorities, never touches trees of more than twenty years' growth. Canon Fowler says the beetle is found "in and about old willows." Personally I have never taken it anywhere but upon poplar, in which also, as a close ally to the preceding, it would naturally occur. *S. populnea* is very common locally on aspen, among which it undoubtedly does much damage by boring into the young stems of saplings, and into the branches of older trees. *Callidium violaceum*, a by no means rare species throughout the country, is taken in some numbers every spring in the New Forest, where I secured a fine series, in May, from a fence about six feet long, dividing the front from the back garden of the house at which I was staying. *Clytus arctis* and *Acanthocinus aedilis*, together with the foregoing species, are celebrated for their tenacity of life in the larval state. There are many records of these beetles emerging from branches, used in mounting birds and other natural history objects, in our museums, after retarded development, lasting several years. The baking to which such branches are treated, and the often powerful disinfectants and insecticides inserted in the hermetically sealed cases having apparently little effect upon them.

Who has not, at least, heard of the Musk Beetle, *Aromia moschata*, which emits so powerful an odour, like that of the sweet plant, its namesake, that the insect may often be detected, like the larva of *Cossus*, by its smell? Most people who know anything of entomology must also be familiar with its beautiful metallic body, which for brilliance and richness of colouring vies with little disadvantage with that of the Brazilian Diamond Beetle. It is said that this is a somewhat common insect in the fens and marshes where willows, upon which only, I believe, it is found, grow in profusion. There is fear, however, that with, alas! so many other species throughout the whole gamut of the British insect world, this lovely beetle is yearly becoming scarcer. It once occurred not uncommonly throughout England

[*Entomologist*, vol. xxv., No. 350], but especially in the London district, being recorded from such present brick-and-plaster localities as Battersea Fields, Lewisham and Hackney. I have never met with the species, eagerly as I have sought for it in many localities, but that it is still to be found, the Rev. Theodore Wood, writing in 1884, points out, when he says he once took ten or fifteen examples from a single willow stump barely a foot high [*Our Insect Allies*, p. 204].

Rhagium inquisitor overthrows the old theory that no beetle ever affects both *Coniferae* and deciduous trees, by occurring on beech, ash, elm and oak, as well as on various species of *Pinus*. It is among the commonest of our *Longicornia*, and may sometimes be discovered in mid-winter, just emerged from the pupæ, in its cocoons in beech stumps, and at the base of various trees, and is still abundant in Epping Forest, where I have turned it up in November in some numbers. In the spring it is often found upon the blossoms of the whitethorn, crab-apple, etc., from which it sucks up the sweetness by means of its hairy ligula, and subsequently lays its eggs beneath the bark of its pabulum.

Our large importation of timber from the Continent, North America, and tropical regions, has caused a great many species of *Longicornia* to occur in England, which could never have been, nor can be, acclimatised to the British Isles. The larvæ of this group, by usually passing several years in that state, and remaining the whole period in the interior of often the largest trees, offer themselves especial objects of export. In this manner there was in the old days much doubt among the British *Longicornia* as to which were and which were not indigenous to this country, and this uncertainty, in some cases, such as that of our largest species, *Cerambyx heros*, is not yet removed. In Stephen's *Manual*, published in 1839, no less than twenty-eight species are doubtfully recorded as British from the above cause.

My friend, Mr. Ernest Elliott, to whom I am indebted for some of the most interesting of the above facts, drawn chiefly from his own observations in Germany, further informs me that the pupa of *Rhagium* is usually found with its back to the surface of the tree or stump.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

HYBERNATING STAGE OF ARGYNNIS AGLAIA.—The following scrap of information is valuable from the fact that *A. ulippe* hibernates as a fully-formed larva *inside* the eggshell, whilst *A. aglaia* hibernates in precisely the same stage *outside* the eggshell. Eggs of *A. aglaia*, received from Mr. Wolfe, hatched about Aug. 13th, 1896, whilst I was on the Continent. They were supposed to be dead when I looked at them through the glass tube, on Aug. 20th. They were turned out on Sept. 16th, and found to be alive, and remained alive till late in November. Evidently the larva hibernates without feeding at all. **EMPTY EGGSHELL AND NEWLY-HATCHED LARVA.**—The empty eggshell is pearly white, only eaten away around the apex. The head of the newly-emerged larva is shiny black, with long white hairs. Skin of body, pale yellowish. The *pro-thorax* with four central tubercles coalesced into a dorsal plate, bearing long brown hairs. A pale medio-dorsal line

runs down the back. A ring of four* dark tubercular buttons on each of the two hinder thoracic and on the abdominal segments—those on the dorsum of the abdominal segments, with two points, each bearing a long recurved dark brown hair. The tubercles are in a similar position (transversely) on each segment. There is a trace of a pale spiracular line.—J. W. TUTT.

DESCRIPTION OF LEPIDOPTEROUS EGGS.—(Continued from p. 90.)—*Ennomos autumnaria*.—The eggs are laid in rows. In the first row each egg is laid on its side, but with the micropylar end much raised above the surface on which the egg is laid. Each succeeding row is laid overlapping the preceding row, so that, although a flat egg, the micropylar end is much higher than the base. The egg is of a deep chocolate-brown colour. It is shaped somewhat like a broad, flat flask (without a neck), with a very conspicuous whitish rim at one end (surrounding the micropylar area), and a shallow depression on the upper surface of the egg. The rim surrounding the micropylar area is oval, the depression within it shallow, with a cellular appearance, the micropyle itself forming a black spot not quite central at the bottom of the depression. The shell itself is not quite smooth, for under a two-thirds lens it has a minutely pitted appearance, with a faint suspicion of the pits being arranged longitudinally. There are also faint traces of a transverse reticulation. [The eggs, for which I am indebted to Mr. Garland, were described under a two-thirds lens on Jan. 15th, 1897.]

Zephyrus quercus.—The egg is echinoid in appearance, a depressed cylinder with rounded edges in shape (viewed laterally), the length : breadth : height as 2 : 2 : 1; *i.e.*, it forms a long oval in vertical, and a circle in horizontal, section. Its colour is of a yellowish milk-white, somewhat waxen in appearance. The surface is covered with a rough, raised reticulation, formed by two oblique series of curved ribs running from the edge of the apical depression to the base, in opposite directions, thus cutting each other and covering the surface with irregularly formed diamond-shaped cells; or the surface may be likened to a chain-harrow, in which the blunted teeth (or tines) extend centrifugally, with no regular arrangement of the processes. The apical depression is somewhat hexagonal in shape, its base pitted; the micropylar rosette, placed centrally in the base, also hexagonal; the diameter of the apical depression about one-third the equatorial diameter of the egg. The diamond-shaped or rhomboidal cells are smaller at the top, and form approximately about 16 rows from the apex to the base. [The description was made (Jan. 18th, 1897) from an egg, sent to me by Dr. Chapman, laid upon an oak-twigg, on which, in spite of its colour, it was not conspicuous, looking like a small, inconspicuous fungoid growth.]—J. W. TUTT.

* My note is unsatisfactory here. It says "four." I believe, speaking from memory, that there were four on each side of the medio-dorsal line, *i.e.*, eight on each segment.—J. W. T.

VARIATION.

VARIATION OF PHIGALIA PEDARIA.—I have just taken from the setting boards a remarkable series of *P. pedaria*, taken by my brother in North-west Yorkshire, last month (February). Of 33 males, 21

have the four transverse bars more or less well developed, though the ground-colour varies very considerably. They range in size from $1\frac{1}{2}$ to $1\frac{7}{8}$ of an inch in expanse of wing. Two others have four black spots on the costal margin—the only indication of the bands. The remaining 10 have no trace whatever of the bands; they vary in size from $1\frac{7}{8}$ to $1\frac{5}{8}$ of an inch, and in colour from black to a dull smoky olive. Two out of six females are black. Another peculiarity is, that all the small dark insects were taken before the 18th. We have occasionally, during the last twenty years, met with dark *P. pedaria*, but only occasionally. There must, of course, be some cause for this abundance of melanic varieties this year. I can hardly see that the comparatively low temperature at the time of emergence, or the excessively wet weather of last autumn, could produce this result. It seems more likely that unusual conditions during the larval stage are the cause, such as dryness or scarcity of food. What do you think?—J. E. BUTTERFIELD, B.Sc., 35, Wrotesley Road, Plumstead, S.E. [The fact that the dark specimens are smaller points distinctly to in-nutritious food, or an insufficient food supply, being a probable factor in this instance. That the scale-determinants in this species have a possible range from olive-green to black, we know, of course; but our want of experience of the species in nature makes us unable to guess as to the lines utility would take in moulding the aberrations once produced into a definite race, but we assume, from our only visit to Yorkshire, that it would be most distinctly in the direction of maintaining the melanic tendencies once they were set up.—ED.]

SENTA MARITIMA AB. BIPUNCTATA.—A specimen of this aberration visited my sugar on the evening of June 22nd last. Although the type and the abs. *wismariensis* and *nigrostriata* have been taken here, I do not remember to have seen any record of the occurrence of ab. *bipunctata*.—F. G. WHITTLE, Southend.

MELANIC TRIPHAENA ORBONA (COMES) FROM SLOUGH.—In June last I bred a few *Triphaena orbona*, with underwings nearly as dark as those I have from Aberdeen and Paisley, and in marked contrast to those I have bred from Burnham.—J. B. WILLIAMSON, 2, Hencroft Street, Slough.

ABERRATION OF PLUSIA FESTUAE.—In the marshes, near Deal, I captured, on July 20th last, a larva of *Plusia festuacae*, which produced an imago having a decided green tone over the wings, and the metallic blotches much smaller than those I have from the North of England or Scotland.—IBID.

ABERRATIONS OF ARGYNNIS AGLAIA AND CIDARIA POPULATA.—I captured, in July last, a specimen of *A. aglaia*, in which two or three spots at the anal angle of the fore-wing are confluent. I also took one brown aberration of *Cidaria populata*.—H. BEADLE, Keswick.

BLACK ABERRATION OF PHIGALIA PEDARIA.—I captured an entirely black aberration of this species in fine condition, in Leicester, on Feb. 21st.—F. BOUSKELL, F.E.S., Sandown Road, Leicester.

SCIENTIFIC NOTES AND OBSERVATIONS.

ON THE PROTECTIVE COVERING OF EGGS IN TEPHROSIA HISTORTATA.—It has been generally stated that the protective covering which certain female lepidoptera lay about their ova, consists of hairs or scales from

the abdomen. I have recently been watching the deposition of ova by *Tephrosia bistortata*. In her case, the covering is one of silk. It is contained in a pouch at the extremity of the abdomen, between the upper part and sides of the vaginal sheath and the abdominal walls. The silk is packed in dense, wavy bundles, about 2mm. in length, and under 1 inch power, closely resembles locks of wavy flaxen hair. It seems to be extruded just outside the vaginal sheath, partly by the working of the ovipositor, which pushes the silk forwards and arranges it around the ova with its very flexible terminal tube. This is used like a finger, and apparently partly entangles the silk by means of short, stiff hairs (most abundant on the two chitinous rods and their branches), which point backwards at an acute angle; and possibly by the few longer ones, eight of which are terminal. The inner distal tube can be protruded as much as 4mm. at least from the sheathing proximal one, and the whole ovipositor seems capable of protrusion outside the body to as much as 7mm. or 8mm. The continuity of the silk is difficult to trace, both in situ and around the ova; but I could not find pieces much more than 2mm. in length, nor any much shorter. How the silk comes to be deposited in the extremity of the abdomen of the imago, must be an interesting matter for future investigation. —W. S. RING, B.A., M.D., F.E.S., Buckerell, E. Devon. March 11th, 1897.

CURRENT NOTES.

Monsieur L. Dupont (3, Rue de l'Orangerie, Le Havre), has sent us a most interesting article on the affinities existing between the North American and European fauna. There is one on the same subject in *British Noct.*, vol. iv., pp. xv.—xx. Another, by Prof. Grote, will appear in due course in the *Proc. of the South London Ent. Soc.*

Monsieur A. Suchetet, Chateau d'Antville, par Bréauté (Seine-Inférieure), asks entomologists to supply him with magazine references (and details of specimens) of hybrid lepidoptera for a work on which he is engaged.

Mr. Newstead records, from the Royal Gardens, Kew, as additions to the British fauna, the Coccids, *Aspidiotus cydoniae*, Comstock, on the trunk of the large sugar-palm (*Arenga saccharifera*), from the Malay Archipelago; *Diaspis calyptroides*, Costa, on several species of *Cacti*; *Coccus tomentosus*, Lam., on *Opaentia fulgida*, recently imported from Arizona.

Mr. J. H. Fowler records that, in 1896, near Ringwood, *Emydia cribrum* appeared on June 1st, when he took 41; on June 2nd, 52, "time to give friends a warning, so wrote to two or three, who put in their appearance in due course. The first day we averaged about 25 each; but upon comparing notes, of course, each stated it to be much less. Very few collectors like showing their captures, or giving numbers, when a good insect is discussed. On June 5th, *E. cribrum* nearly over, saw four only" (*Entom.*). Roughly, about 300 specimens in four days. Was the insect "nearly over" or "nearly exterminated" for the season? We also admire Mr. Fowler's estimate of the collectors' veracity.

Mr. Bankes refers the unique specimen of *Tinea cochyliella*, Sta.,

captured by Douglas, at Sanderstead, July 7th, 1852, now in Dr. Mason's collection, to *T. ruricollis*, of which species he considers it a strongly aberrant specimen. He is inclined to keep *T. ruricollis* specifically distinct from *T. cloacella*, because, in 1893, the former was bred by Machin, from fungi, collected in Swanscombe Wood, Kent, and there were no *T. cloacella* among them.

We had hoped to have found space to review the *Proceedings of the South London Ent. Society*, and *The Transactions of the City of London Ent. Soc.*, but, unfortunately, cannot. There are still some provincial entomologists, we believe, who do not see these publications, and hence miss many facts relating to entomology which it is necessary to know if one wishes to be *au fait* with the subject. The few pence each costs is infinitesimal.

The bye-laws of the Entomological Society of London are undergoing revision. Among other alterations, an increase in the number of members of the Council is suggested.

A most interesting paper on the generative organs of gynandromorphous Lepidoptera is published in the *Illustrierte Wochenschrift für Entomologie* for April 4th.

PRACTICAL HINTS.

Field Work for May and early June.

By J. W. TUTT, F.E.S.

1.—“The larva of *Bucculatrix cristatella*, in May, mines the leaves of yarrow, and then eats the leaves half through from the outside” (T. WILKINSON).

2.—The larva of *Coleophora chalcogrammella* was discovered in the larval state by Mr. T. Wilkinson, near Scarborough, feeding on the leaves of *Cerastium arvense*, in May.

3.—In May, the larvæ of *Batalis senescens* make little web-galleries amongst moss at the roots of thyme.

4.—Sweep the reeds by night for larvæ of *Leucania straminea*, in late May and early June.

5.—Old seed-heads of *Juncus maritimus* should be gathered in May for cases of *Coleophora obtusella*.

6.—Bright green larvæ, collected in May, feeding in the shoots of *Salix caprea*, and drawing the leaves together with a slight web, will most likely produce *Penthina capreana*.

7.—In early May, search golden rod in shady places for larvæ of *Leioptilus tephradactylus*. Their presence is easily detected, as they strip the leaves pretty successfully.

8.—“At the end of May, 1870, I beat three of the larvæ of *Agrotis subrosea*, in the evening twilight, from *Andromeda polifolia*, L. In captivity, they also ate several species of willow” (BERG).

9.—The larva of *Harpigeryx scabrella* may be beaten into an umbrella from hawthorn, early in June. It is not unlike *Cerostoma radiatella*, but has a white stripe down the back, and I do not think it is quite so lively. It is easy to feed up, and spins a beautiful cocoon of white silk, boat-shaped, with a triangular transverse section (RICHARDSON).

10.—The larva of *Nepticula poterii*, in early June, mines the leaves of *Poterium sanguisorba*.

11.—Spun shoots of *Lotus major*, collected in early June, will give larvæ of *Anacampsis vorticella*.

12.—Examine stunted whitethorn and blackthorn bushes, growing on exposed slopes almost anywhere. During the first fortnight in June you will find the silken galleries of *Rhodophaea suarella* spun close to the twigs.

13.—Examine well-grown plants of *Echium vulgare* on exposed slopes, during the second week in June. *Douglasia ocerostomella* sometimes abounds, flitting about such plants, from 2 p.m. to 4 p.m.

14.—From the middle to the end of May, beat junipers for the larvæ of *Eupithecia sobrinata*.

15.—The first week in June, search aspen and poplar. The larva of *Tethea subtusa* lives in a single leaf turned over on one side, and fastened with silk; that of *Taeniacampa populeti* lives between two leaves, one fastened on the top of the other.

16.—When the foxgloves are in flower, search the solitary plants growing in the open spaces in, or on the outskirts of, woods, for spun-up flowers containing larvæ of *Eupithecia pulchellata*.

KILLING INSECTS.—I see that “naturalists” are now prohibited from selling cyanide bottles. I have lately tried H.C.N. (strong solution, made in laboratory, not bought) for killing. The effect is really instantaneous as far as I can make out—no fluttering occurs. I use it like ammonia '880, *viz.*, a drop or two on blotting paper put into the pill box.—E. W. WAKE BOWELL, Sissinghurst Vicarage, Cranbrook, Kent.

NOTES ON COLLECTING, Etc.

MIXTURES FOR SUGARING.—I should very much like to know the opinion of lepidopterists as to different sugaring mixtures, so as to find out the most attractive. I have used the following:— $\frac{1}{2}$ pint ale and $1\frac{1}{2}$ lbs. sugar, boiled, skimmed, then bottled. From this I fill a small bottle for use when wanted, and add about one teaspoonful of rum. This makes a rather thin mixture, but instead of using a brush, I take a very little in my mouth, and, with a sharp spurt, send it out in fine spray and small drops. I do not know of anyone else using this method, but the advantage is that you can apply it anywhere, and I find bushes in leaf, sugared in this way, will attract moths when I cannot get one on the tree-trunks, and the bushes always pay much better than the trees. The sugar I now use is as above, with the addition of a drop or two of essence of pear, and this adds about 10 % to its attractiveness. I have tried methylated spirit, and do not like it.—H. A. BEADLE. [We don't think we should “like” methylated spirit, beer, &c., applied in the fashion described, but “it's all a matter of taste, you know—simply a matter of taste.”—ED.]

With regard to the mixture that I use, I merely put a few pounds of coarse sugar (date sugar for preference) in a jar, and pour a little beer on it, and let it soak a few days, when it will be ready to pour into your can. I never boil it, and seldom put either rum, methylated spirit, or any of the essences in it; for myself I don't believe they add to the attractiveness. I have on many occasions sugared a round in the same wood and same time as my friends here, who

have used essence of pear, etc., and have always fared as well as they, and I find sometimes that sugaring the foliage pays far better than sugaring the trunks.—A. H. HAMM.

APORIA CRATAEGI IN KENT.—A few more explicit notes as to my capture of this insect in Kent, last year, will, I think, be looked for, especially by those gentlemen with whom I exchanged specimens, since Mr. Tutt, in his "Retrospect for 1896," says there is "little doubt but that they are the progeny of planted Continentals."* This I do not think is the case, considering that *Aporia crataegi* was at one time so common and widely distributed throughout Kent. I think Mr. Tutt and others, who may at present feel rather sceptical as to the English genuineness of the insects, will, after reading the following notes, agree that they are the progeny of an indigenous colony, which have been for many years breeding in the locality where I captured them. Some nine or ten years ago, an acquaintance of mine told me that he had taken the Black-veined White not very far from Dover, but as he would not tell me the locality, and left the town shortly afterwards, I gave up all hopes of taking it, and began to wonder whether he might not have been mistaken as to the insect. I thought no more about *A. crataegi* (or perhaps I should say I thought it extinct) until the autumn of 1895, when an entomological friend of mine told me that, in 1893, a person coming in from the country, knowing him to be a collector, told him there had been such numbers of a large white butterfly in the fields near her house, and as he had at the time a book on butterflies before him, he showed her plates of the "whites," and she, readily distinguishing the insect, pointed out *A. crataegi*. He was very much surprised, and thought she must have made a mistake. Owing to ill health, he found no opportunity of visiting the neighbourhood in which he had been told they were to be taken. He told me of this incident, and, on June 21st last, I went to the spot, and found large numbers of *A. crataegi* in a clover field, and took about two dozen (I could have taken two score). The following day I again went and took a few more, and I also watched a female lay some eggs on the extremity of a leaf of whitethorn, of which there was a thick hedge bordering one side of the clover field. The insects were very sluggish in their movements, and easily captured. They seemed confined to the clover fields, in which grew quantities of the ox-eye daisy (*Chrysanthemum leucanthemum*), for which they seemed to have a predilection, and when disturbed soon settled down again. I left home the following day (Wednesday), and did not return until the middle of July, when I thought it would be too late for *A. crataegi*, and I have not been to the place, which is some distance from this town, since; however, I hope soon to go and look for the larvæ, which I think I should have no trouble in finding, as I left scores of *A. crataegi* flying about. I have made enquiries as to the whereabouts of the man who first told me about *A. crataegi*, and find that he caught nine specimens and gave them to his brother-in-law, who is now living in Dover. I called on him a short time since, and saw the nine specimens, which are with other insects, one of the others being no less than a *Deilephila galii* (!),

* We do not remember having made this statement. We said:—"We have little doubt that this is a colony, the progeny of ancestors that have been set at liberty, and have effected a temporary settlement."—EP.

and of which he did not know the name, now in a case hanging in one of his rooms. He told me that they were caught in July, 1886, at rest on bramble in the same locality as my 1896 specimens. He laughed at the idea of "planting" when I ask him whether he knew if they had been brought from the Continent and let loose, and said, "I shouldn't think anybody would take the trouble." An interval of ten years elapsed from the time of my having been first told about *A. crataegi* being taken near Dover, and my capturing them, which points very strongly to the fact that they have at least been breeding in this special locality for the past ten years, and are, in my opinion, the last remaining link connecting them with the *A. crataegi* of bygone days. The whole story of my capture may be summed up as follows:—I was told some nine or ten years ago that *A. crataegi* was to be taken near Dover. In 1895 I ascertained the locality, and in June, 1896, captured them, and, having recorded it, am told they are undoubtedly planted foreign specimens.—H. DOUGLAS STOCKWELL, 2, Albert Road, Dover.

[How Mr. Stockwell can have converted our carefully worded general statement into the definite statement he has substituted, is beyond our comprehension. Like our correspondent's friend, we also are inclined to laugh at the idea of anyone "bringing *A. crataegi* from the Continent and then letting them loose." We never make suggestions without fair knowledge that our suggestions are probably true. For many years Mr. Edmonds bred *A. crataegi* in the open, at Windsor, and hundreds possibly escaped. We have a letter in our possession, in which the fact is stated that several hundreds of pupæ were bought on purpose to re-stock the old haunts of this species. Two excellent lepidopterists, whose names are well known to our readers, having bred some dozens of this species, and having no wish to indulge in the doubtful pleasure of killing the specimens wantonly, set them free. Two large broods that we kept ourselves for observation in the larval state, escaped from our own garden, owing to the growing branches of the plum tree, on which they were feeding, forcing their way through the sleeves. These instances might be increased tenfold without trouble. So long as the lepidopterists in Britain are aware that hundreds of this particular species have been set free in Surrey, Essex and Kent, science is not injured. The district around Dover was well worked from 1880 until 1890, when we ourselves spent the greater part of each summer, with other entomologists, in the neighbourhood. Of course we might have missed *A. crataegi*, but there were very few species we did miss at that time. Like Mr. Stockwell, we don't think anyone brought *A. crataegi* from the Continent and let them loose just where he caught them. We never suggested anything so unlikely.—ED.]

ACHERONTIA ATROPOS IN THE GUILDFORD DISTRICT.—Although for several years past I have heard rumours of the occurrence of this interesting species in the district, I only succeeded in obtaining specimens, in any stage of development, last year. Early in November, potato-digging on a large scale was in progress near, so I made enquiries of the men engaged thereon, and at last met a very intelligent man, who informed me that about twenty pupæ had been found during the previous day or two in a field where he was working, and he was able to describe the pupa of *A. atropos* sufficiently to

convince me of its occurrence there. When I asked what had been done with them, he told me the boys employed in the field had played "tip-cat" with them!! the pupæ of *atropos* taking the place of the "cat," I presume? His disgust was nearly equal to my own, when informed what they were worth. I saw him again a few days after, and he had obtained three or four more pupæ, but unfortunately—with one exception—they were all more or less damaged. The perfect one was forced, and although it showed signs of life for a week or two, it eventually succumbed to the rough handling it had received.—W. GROVER, Guildford. *March, 1897.*

TEPHROSIA BISTORTATA AT READING.—It may interest your readers to know that I took, on March 21st, two specimens of *T. bistortata* in the wood in which, in July last, Mrs. Bazett got eight specimens of so-called second brood of *T. crepuscularia* (*biundularia*). When these specimens were exhibited, Mr. Adkin and yourself were of opinion that they were examples of the second brood of *T. bistortata*, although this species was stated not to occur in the woods. It looks as though Mrs. Bazett and her supporters will have to agree with your conclusion, and give up the "notion" that the specimens were those of a second brood of *T. crepuscularia*, *Ent. Rec.*, viii., p. 223. Since March 21st, I have taken two more specimens of *T. bistortata* in the same woods. They have all been taken in or close to a larch plantation, right in the middle of a beech wood, interspersed with oak. I have looked over the beech, but have not found *T. bistortata* there nor, up to the present this year, *T. crepuscularia* (*biundularia*), although the latter species is frequently common in this wood in the latter part of April and in May. We shall get this in three weeks' time. The time of appearance of the *T. bistortata* in these woods coincides with that of the species in our best-known *T. bistortata* locality. Mr. Hamm took the latter species in the latter place on March 21st and 22nd, in fine condition. Mr. Holland has seen my specimens, and is satisfied.—J. CLARKE, 26, Zinzan Street, Reading. *April 4th, 1897.*

EARLY COLLECTING NOTES.—*Reading.*—*Endromis versicolor* was out on the heath on March 19th, the earliest record here.—J. CLARKE.

I have been successful in rearing *Endromis versicolor*. I found a female on April 6th, 1896, and have bred, from ova laid by her, some very fine specimens during the last month. I have also got fertile ova from the progeny.—W. BUTLER, Hayling House, Reading. *April, 1897.*

Bituary.

ALBERT HOUGHTON, Died Feb. 23rd, 1897.

Those whose habit is to visit Wicken during the collecting season will, in future, miss a familiar face and voice. Mr. Albert Houghton, who is so well known to many as one of the professional collectors of that district, died on February 23rd. I have many recollections of his genial humour and kindly readiness to help, both in pointing out good localities in his neighbourhood, and also with his sugar and lighting apparatus in the fens. He had a great knowledge of the habits of the insects of his own locality. By careful and diligent searching he discovered, a few years ago, a locality in which he took many specimens of *Tapinostola concolor*. He never despaired of re-discovering *Agrotis subrosea*, and during the years 1894-5 worked hard

in its old habitat among the beds of *Myrica gale*, but his efforts in that direction were not crowned with success. I believe him to be the only collector who has taken *Hadena atriplicis* quite recently—it would not be altogether surprising if that species were now to become extinct. He used to warm with enthusiasm over his tales of the golden days when *Laelia coenosa*, and other species, now, alas! all too scarce, if not altogether extinct, were not unfrequently taken. His regret for those happy days made him most careful to preserve on every possible occasion the food-plants of scarce or local species. In this, as in many other respects, I, in common with many other entomologists, shall have cause for missing him sadly.—J. C. MOBERLY, M.A.

JAMES B. HODGKINSON, F.E.S.

Born Oct. 27th, 1823, Died Feb. 17th, 1897.

James B. Hodgkinson was born at Preston, but when only four years of age, his parents removed to Carlisle. At fourteen, he returned to Preston, where he served seven years' apprenticeship as a mechanic, although, for two years previous to his apprenticeship, he had worked as a boy in a mill, from 5.30 a.m. to 7.30 p.m., at 2s. 6d. per week. Even then his love of collecting had commenced, and on Saturday and Sunday he would walk to Keswick and back to catch butterflies and moths. An early meeting with Wailes (Newcastle) and Hancock was said by Hodgkinson to have been the origin of his entomological tastes, and, at 19, he gave a lecture at the Mechanics' Institute, at Preston, on "Entomology." From Preston he removed to Manchester, where he had free access to Sam Carter's collection, and obtained such insects as *Lithomia solidaginis* and *Oporabia polata* (*filigrammaria*). Of the latter insect, he states that he once took forty-two in a short time, on stones in a stream, when the stone walls were unproductive. He was also one of the first entomologists to obtain *Nyssia zonaria* at New Brighton, whilst he always insisted that he was the first captor of *Cidaria reticulata*, *Hydroecia petasitis* and *Aplecta occulta* in England. He relates that on one occasion, "old Weaver" called on him when he (H.) had a number of *Hydrelia unca* in duplicate, and Weaver then offered him *Anarta vidua* (*melanopa*) in exchange, the *H. unca* being valued at 6d., the *A. vidua* at 7/6 each, so he says "the exchange did not come off." He only saw Weaver once after this, and then he was "hiding behind a tree in the Black Forest, Rannock." He claimed acquaintance at this time with E. Sheppard, Bond, Bentley, S. Stevens, Bouchard and Waring. He visited B. and J. Standish, and once visited J. Jenner Weir. Of Desvignes, he had a lively recollection, for the latter gave him a number of Pyralides and other insects, which he took at Whittlebury Forest. He also knew Bedell, Stainton, Douglas, Ingall, Robertson (and his man Hindley). About that time, too, he relates that he once walked into the West India Docks with a box of insects under his arm, and when he was coming out again, the box was examined. At the time, he asserted, there was a duty on foreign insects, and had it not been that one of the men knew something of British insects, he would have had to pay duty on the specimens, or they would have been forfeited.

Hodgkinson was not a collector pure and simple, although it was his wish to obtain fine specimens and to find new species that led him to add many facts to our knowledge of the life-histories of the

insects he reared for these purposes. The hardships of his early life led him to put a money value on every insect he captured, and herein, perhaps, he was not very different from those whose lots have been cast in easier places. For some years he openly dealt in insects, buying and selling all the reputed British species, as Stevens' catalogues show. Of late years he had been much more successful in business matters, and gave up selling insects, in fact, he was a frequent buyer at Stevens' salerooms himself. When a lad he lost one eye (blown out when shooting), but to the last he could see as much with the other one as most people can with two. How keenly the competitive method of collecting lepidoptera had hold of him may be surmised from the following extract from a letter written only two months before his death. He writes: "When I was working at Northfleet I used to walk in to Dartford every morning before work, in order to be first at the fence for *Aleucis pictaria*." He was also very keen on the rare Lepidoptera. Only a few days before his death (Jan. 27th) he writes: "Have you seen in the *Entom.* the advt. of 'old' *Nyssia lapponaria*? I wrote to the advertiser the day after the advertisement appeared, but have had no reply. I asked how they came to be 'old.' Had the advertiser had them by him, as *N. zonaria*, without knowing what they were?" The addition of a species not in his collection was to him a matter of joy beyond description. We received at least three letters during the fortnight before his death, begging for information as to where he could get a specimen of *Rhodophaea rubrotibiella* and *Oxyptilus hieracii*, the former at best but a doubtful species, the latter probably never really taken in Britain. The mania to obtain new species led him oftentimes to describe odd specimens that he could not at once determine. as such, and hence he incurred the contempt of some micro-lepidopterists for his precipitate haste. At the same time, he really has made some notable additions to the British lists, and his energy and capacity for hard work are worthy of all praise. Compared with some of the *dilettanti* entomologists of the present time, to whom field work, with the exception of going for special rare and local species for exchange, is unknown, J. B. Hodgkinson was an enlightened naturalist. He was well versed in the life-histories of a very great number of micro-lepidoptera, and his observations on the Tineina—*Lithocolletis*, *Nepticula* and *Elachista*—only ended with his death. The poverty of his early life, the long hours of work for a bare subsistence, the accident which left him with his sight impaired, had no power to check his entomological ardour, and he stands out clearly an example to men whose lots have been cast in pleasanter places, whose professional duties leave them much comparative leisure, and yet who not only have no knowledge of *Nepticula* and *Lithocolletis*, but could not even tell the name of a Crambus or a Pyrale, and whose knowledge of the TORTRICIDÆ is only equalled by the ignorance of those who scoff at "bug hunters."

By the death of J. B. Hodgkinson, at the age of seventy-four, we have lost an entomologist "of the old school," one of those collectors whose every spare moment was spent in the open fields, and who learned by observation of actual objects the facts of their existence. For that old school we have every respect. It served its purpose—a good purpose—and has enabled us, by its accumulation of facts, to progress at a rapid rate in the more philosophical branches of our

subject. One by one the remnant of this old school is dying out, and we, of the newer school, have many reasons to regret the decease of the last victim that death has claimed.

SOCIETIES.

CITY OF LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.—March 16th, 1897.—*T. CREPUSCULARIA* (*BIUNDULARIA*) NOT IN MORAYSHIRE.—Mr. Tutt said that it had been stated, on the strength of a specimen in Mr. Adkin's possession, and another in Mr. Horne's, that *T. crepuscularia* (*biundularia*) was found in the Altire Woods in Morayshire. He had examined Mr. Adkin's specimen, and so also had Mr. South, and Mr. Adkin, Mr. South and himself were all inclined to refer it to *T. bistortata*. He now exhibited Mr. Horne's specimen, captured on April 16th, 1892, on the trunk of a pine tree in Altire Wood. This, a male in fine condition, is identical with the Perthshire race, which, as has been pointed out, is more nearly allied to the Central European typical form of *T. bistortata* than any other form occurring in Britain. Mr. Tutt further said that, although he had not yet seen specimens of *T. crepuscularia* (*biundularia*) from Scotland, he suspected that the southern counties, at least, would produce the species. Mr. Adkin stated that Mr. Horne's specimen was a very fine one, and dark. His (Mr. A.) specimen had been sent to him alive, and, having spent some hours in a chip box, had injured itself considerably, but he had been fortunate in obtaining a few eggs, which produced larvæ in due course, and he expected the imagines shortly now. ON THE LARVAL NEST OF A GREGARIOUS EUROPTERID MOTH.—Mr. Tutt exhibited a nest of an Europterid, which he had received from Dr. Chapman, who had cut it from a pine tree in the neighbourhood of Cannes the previous week. He did not know which species it was—one member suggested *pityocampa*—as he was quite ignorant of the larvæ of the members of the genus to which they belonged. The larvæ were busy feeding, some being outside the web at the time the exhibition was being made. Mr. Tutt said that, when not feeding, the larvæ retired within the web, and came out again to feed. He also referred to the urticating properties the hairs of these creatures were said to possess, but stated that, although he had handled these larvæ, he had felt no ill effects. THE EGGS OF *T. BISTORTATA* AND *T. CREPUSCULARIA* (*BIUNDULARIA*).—Mr. Tutt made some remarks on eggs of *T. bistortata*, eggs of *T. crepuscularia* (*biundularia*) and eggs of ♀ *T. bistortata*, that had been fertilised by a ♂ *T. biundularia*. The first two sets showed considerable differences, which were exhibited by drawings made under the microscope by Messrs. Rowe and Baty. The eggs of *T. bistortata*, as exemplified by the batch that had been examined, were long and cylindrical, with rounded ends. Those of *T. crepuscularia* (*biundularia*) were of only about two-thirds to half the cubical contents of those of *T. bistortata*, and, although exhibiting considerable variation, were of a somewhat oval form, or inclining to the shape of a hen's egg. To the naked eye, there did not appear to be much difference in colour, both being of a pea-green, but those of *T. crepuscularia* (*biundularia*) were of a somewhat yellower tint. Under the microscope, however, the difference of colour became more marked, that of *T. bistortata* appearing of a pearly-green hue, that of

T. crepuscularia being yellow, and whilst the shell of the former was iridescent and slightly transparent, that of the latter was somewhat opaque. There were also faint traces of longitudinal ribbing, just round the shoulder of the micropylar end, in the egg of *T. bistortata*, such traces not being discernible in the egg of *T. crepuscularia*. The egg of *T. bistortata*, too, was also noticeable for small irregular depressions, which occurred on the surface, and which appeared to be due to pressure or the contraction of the protoplasmic contents of the egg. These were not to be seen in the egg of *T. crepuscularia*, the shell of which appeared, under a high power, to be minutely pitted. Another character of differentiation in the two sets of eggs observed, was in the position of the lateral depression, which is so characteristic of many Geometrid eggs. In the egg of *T. bistortata*, the depression was placed well toward the micropylar end, whilst in the egg of *T. crepuscularia* it is placed much nearer to the centre. In the set of *T. bistortata* eggs examined, which had been fertilised by a male *T. biundularia*, the general shape, colour and appearance were very similar to those of the first set of *T. bistortata*. The eggs were, however, slightly smaller, and tended to be a little more rounded at one end than the other, showing some trifling variation between the two sets, and one or two of the eggs out of a considerable number examined, exhibited a most complete oval shape. They were, however, still very distinctly *T. bistortata* eggs, as apart from those of *T. crepuscularia*. In colour, the cross fertilisation seems to have had some effect, for the eggs were, under a good power, certainly yellower than the other batch of *T. bistortata* eggs. This may, however, have been due to a slight difference in age. The lateral depression of this batch of eggs was puzzling, but, after a number of eggs had been repeatedly examined, it was found that it was placed well up towards the micropylar area, but was somewhat obscured by the depressions described as being characteristic of *T. bistortata*, being often placed in close proximity therewith. These eggs, like those of many other species that are laid in crannies, etc., e.g., *Orrhodia*, etc., appear to be capable of much modification in shape by pressure, the moth pushing the egg into a cranny, and the soft egg being affected, more or less, by the pressure, and becoming somewhat similar in shape to the cranny into which it is pushed. It is very probable that the eggs of these two species have never before been examined side by side under the microscope, owing to the different dates at which the insects usually appear. The chance of doing so now is due to Mr. A. Bacot, who, by forcing the pupæ of *T. crepuscularia*, brought out the imagines at the same time that those of *T. bistortata* were appearing in the breeding cages. By this means also he obtained pairings between ♀ *T. bistortata* and ♂ *T. crepuscularia*, although it appeared that they would not cross the other way. This is, of course, exactly parallel with Dr. T. A. Chapman's experiment, when he forced *A. betularia* to appear in March, obtained pairings between that species and *A. strataria*, and not only obtained fertile ova, but bred the hybrid imagines. LIVING SPECIMEN OF *AGLAIS URTICÆ*.—Mr. Garland exhibited *A. urticae*, taken at rest upon a brick wall at Harrow Green, Leytonstone, about 10 o'clock in the morning of Feb. 19th. ABERRATIONS OF *HYBERNIA DEFOLIARIA*.—Mr. Garland also exhibited bred male aberrations of *H. defoliaria*, being larger than captured specimens. *BRUCHUS LENTIS*.—Mr. Newbery exhibited *Bruchus*

lentis, from Egyptian lentils. He read the following notes: "This species is erroneously stated to be without a thoracic tooth, by both 'Cox' and 'Fowler,' although the contrary is stated in the original description." FIELD OBSERVATIONS.—Mr. May said that he had found *Asphalia flavicornis*, *Taenioecampa stabilis*, *T. pulverulenta*, *T. incerta*, *T. munda* and *T. gothica*, on Feb. 27th. RARE SPECIES.—Mr. Tutt exhibited a series of *Cedestis gysselinella*, Dup., captured by Lord Walsingham and Mr. Durrant at Merton on July 4th, 1896; specimens of *Steganoptycha pygmaeana*, Hb., captured by Mr. Durrant, also at Merton, on April 19th, 1896. Also a specimen of *Caratemna terebrella*, Zk., bred by Mr. Durrant on July 18th, 1896, from *Cephalonica*, at Merton. LOCAL COLEOPTERA.—Mr. Heasler exhibited his collection of Clubhorned Coleoptera, the latest additions being *Myrmestis piceus*, taken in a nest of *Formica rufa*, in the New Forest, and *Rhizophagus ferrugineus*, captured in Richmond Park, under bark.

NORTH LONDON NATURAL HISTORY SOCIETY.—March 25th, 1897.—NOTES ON BREEDING PERIDROMA SAUCIA.—Mr. Prout bred series of *P. saucia* from ova, laid by Sandown ♀s, on which he read the following notes:—"The brood, No. 2, is a small batch bred last winter from a ♀ of the aberration *nigrocosta*, Tutt. It will be observed that 13 out of the 24 show a tendency, more or less pronounced, to follow the parent ♀, though varying considerably *inter se*. In the palest two or three this tendency only asserts itself through a darkening of the thorax, and the extreme base of the costa, and through the dark filling-in of the orbicular. The remaining 11 are of the normal red-costa form—*saucia*, Hb.—yet not precisely the same as brood 1, appearing to me to be of a rather more *purpled* red. Brood 1 is a representative selection from a large batch, bred in the winter of 1895-6, from a typical ♀. Not one of a large number, bred by myself and friends (some hundreds, I should think), inclined towards the ab. *nigrocosta*, not even to the extent of showing the dark orbicular. They were very constant, on the whole, the only deviation from type being in the direction of paling off towards whitish-grey. Neither of the broods contains a single example of the ochreous or mottled form known as ab. *aequa*, Hb., nor ab. *margaritosa*, Haw., and it will be interesting to breed a series from a ♀ of one of these forms when opportunity offers."

NONPAREIL ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.—April 1st, 1897.—BREPPOS PARTHENIAS IN EPPING.—Specimens of both sexes of *B. parthenias*, recently taken in Epping Forest, were exhibited by Mr. Craft, sen., Mr. Craft, jun., and Mr. Harper. Mr. Lushy exhibited a series of *B. parthenias*, taken in Epping in 1895; and on comparison with those captured this year, a distinct inferiority in size was noticeable. RECENT CAPTURES.—Mr. Craft, sen., exhibited *Larentia multistriaria* and *Taenioecampa pulverulenta*, captured in Epping Forest. Mr. Harper also exhibited *Larentia multistriaria*, *Anticlea badiata* and *Scopelosoma satellitia* from the same locality; whilst a very fine, recently-bred series of *T. miniosa* was exhibited by Mr. Samson from larvæ obtained near Winchester last year. Mr. Stevens exhibited *Amphidasys strataria*, both sexes, the ♂ bred and the female captured in Richmond Park.

ENTOMOLOGICAL SOCIETY OF LONDON.—April 7th, 1897.—PHOTOGRAPH OF BRACHYCERUS APTERUS.—Mr. McLachlan showed, on behalf of Mr. Gerald Strickland, a magnified photograph of *Brachycerus*

apterus, obtained by direct enlargement in the camera, and extremely clear in definition and detail. SILK OF *TEPHROSIA BISTORTATA*.—Mr. Tutt exhibited some of the silk used by *Tephrosia bistortata* to cover its ova, and discovered by Dr. Ridg. It was contained in a pouch at the extremity of the abdomen, in the form of dense bundles about 2 mm. long, and resembling, in miniature, locks of wavy flaxen hair. Hitherto all such coverings were supposed to consist of scales from the anal segment.

COMMITTEE FOR THE PROTECTION OF INSECTS IN DANGER OF EXTERMINATION.—At the meeting of the Entomological Society of London, held on the 7th instant, the following memorandum of association was adopted and signed by the President, the Council, and many members:—"We, the undersigned, being desirous of protecting from extermination those rare and local species of insects which are not injurious to agriculture, nor to manufactures, do hereby agree, by our own example, and by the exercise of our influence over others, to discourage the excessive collecting and destruction of those species of insects which, from their peculiar habits or limited range, are in danger of extermination in the United Kingdom. We further agree to accept, for the purposes of this association, such lists of species in need of protection as shall be drawn up, and from time to time, if necessary, amended, by the committee of the Entomological Society of London appointed to this end." A copy of this memorandum of association has been forwarded for signature to such of those societies which have expressed themselves as being in sympathy with the objects of the committee.—C. G. BARRETT, F.E.S., *Hon. Sec.*, 39, Linden Grove, Nunhead, S.E. *April 19th, 1897.*

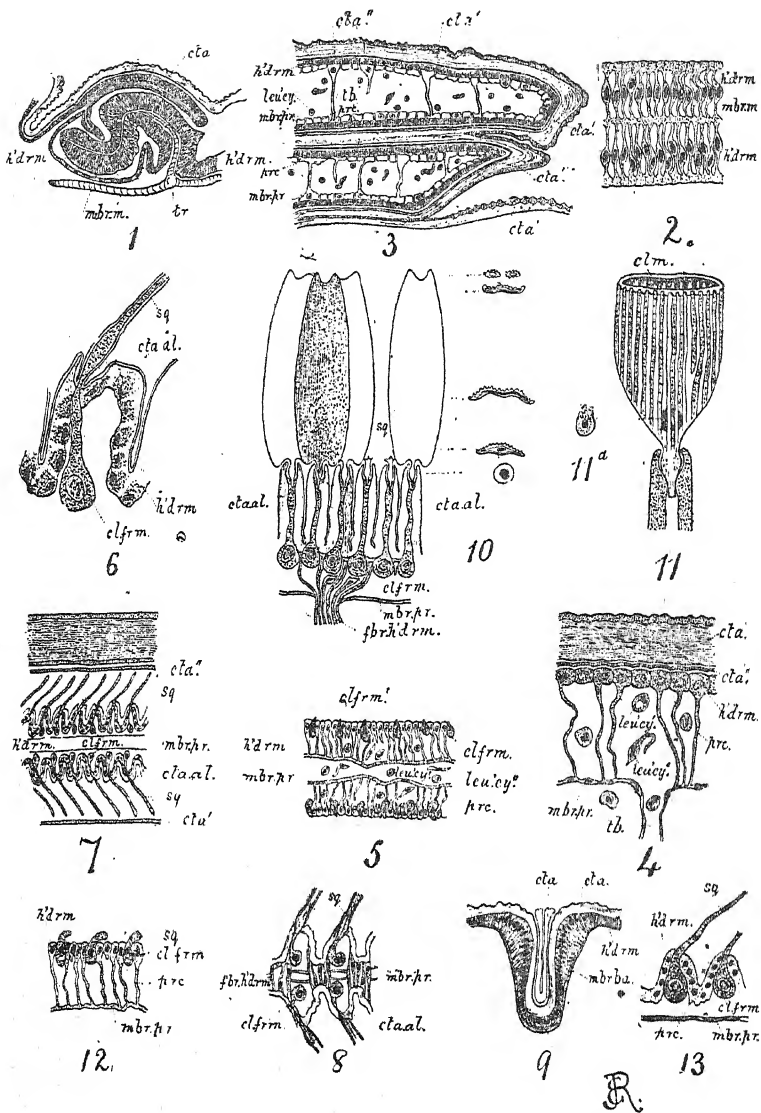
REVIEWS AND NOTICES OF BOOKS.

ON MECHANICAL SELECTION AND OTHER PROBLEMS. By Karl Jordan, Ph. D. [From *Novitates Zoologicae*, Dec., 1896.—Quarto, 100pp., 4 pl.]—This is a paper that every scientific entomologist must read. It deals with the principles of "physiological selection," the accessory organs of the reproductive system of lepidoptera, the value of the term "species," etc., with special reference to the genus *Papilio*, and the philosophical questions arising therefrom. The paper is carefully worked out and closely reasoned, and the whole essay deserves the careful study of all entomologists.

PRACTICAL HINT ON *APAMEA OPHIOGRAMMA*.—Now is the time for larvæ of *A. ophiogramma*. Here and there the striped grass shows a drooping or faded leaf. Find the bottom of the infected shoot and pull, avoiding pressure as much as possible. In the stem, generally head upwards, lies the larva. It feeds only as far as the solid or semi-solid part of the stem goes. When that is gone it leaves for another stem, which it enters by making a large, irregular hole near the ground.—(Rev.) C. R. N. BURROWS. *April 24th, 1897.*

ERRATA.—*Tiliacea aurago*.—p. 61, line 1, for "Sept. 4th, 1896," read "Oct. 4th, 1896." *Cirrohedra xerampelina*.—p. 60, line 25, for "Aug 4th, 1896," read "Sept. 4th, 1896."—W. BARNES, 7, New Road, Reading.

p. 44, line 9 from bottom, for "*Aspidiopus*" read "*Aspidiotus*." p. 80, line 6, for "specimen" read "species."



THE DEVELOPMENT OF THE WING, WING-SCALES AND THEIR PIGMENTS IN
BUTTERFLIES AND MOTHS.

The Entomologist's Record

AND

JOURNAL OF VARIATION.

VOL. IX. No. 6.

JUNE 15TH, 1897.

The development of the wing, wing-scales and their pigments in Butterflies and Moths.* (*Illustrated by Plate*).

By J. W. TUTT, F.E.S.

I.—THE DEVELOPMENT OF THE WING AND WING-SCALES.—A short time since, we gave a brief account of the development of the wings of lepidoptera (*Ent. Rec.*, viii., p. 111). In it we stated that Verson had found traces of wings in the embryo caterpillar of *Bombyx mori* some days before it leaves the egg, when the wing consists of a few cells in close propinquity with a tracheal branch placed in the interior of the wall of the body on the meso- and post-thoracic segments. Landois (1871) and Pancritus (1884) discovered the rudimentary winglets in young lepidopterous larvæ only 4mm. long. At this time they appear as infolded hypodermal pockets, penetrated by tracheæ. When the larva is full grown it is evident that the wing is really a folded portion of the hypodermis (*h'drm.*, Pl. iii., fig. 1) itself, enclosing a thin layer of mesodermal tissue (*mbr. m.*, Pl. iii., fig. 1). The conditions, however, are complicated. The wing-pad proper is a pocket-like outfolding of the hypodermis, which is more or less folded upon itself. This pocket, instead of lying exposed between the hypodermal covering of the larva and its cuticula, is protected by being sunk into a deep sac-like infolding of the hypodermis, the walls of which are very much thinner than those of the wing-pad, and, indeed, thinner than the rest of the hypodermis. The walls of the infolded sac follow quite closely the foldings of the wing-pad itself. In penetrating, from without inward, one would traverse, in the region of the wing-pad, five layers of the epidermis: (1) The outer and inner layers of the operculum-like fold of the hypodermis which covers in the wing, then, in succession, (2) the thick outer and inner layers of the wing-pad, and (3) the thin inner layer of the infolded sac (Mayer).

The tracheæ (*tr.*, Pl. iii., fig. 1) penetrate between the two thickened layers of the wing-pad, the outermost layer being destined ultimately to form the upper wall of the future wing, the inner layer becoming the lower wall. The cells which compose the wing-pads are more crowded in the longitudinal direction than in the direction across the wing. The cells forming the tissue at this time are spindle-shaped hypodermal cells (Pl. iii., fig. 2). When the larva changes

* A critical summary of a paper on "The development of the wing-scales and their pigment in butterflies and moths," by Alfred Goldsborough Mayer [Published at The Museum, Cambridge, Mass., U.S.A.].

into a pupa, the wings expand to about sixty times their former area, and the cells, being no longer crowded, lose their spindle shape, and flatten out into a pavement epithelium.

The chitinous outer cuticula (*cta.*') of the pupa encloses each wing in a separate sheath (Pl. iii., fig. 3), exhibits a stratified condition, and is deeply pigmented near its outer surface (Pl. iii., fig. 4). A delicate structureless membrane, known as the inner cuticula (*cta.*"', Pl. iii., fig. 4), lies between the outer cuticula (*cta.*') and the hypodermis (*h'drm.*). At this stage each wing consists of a hollow bag, the wall of which is composed of a single layer of hypodermal cells (*h'drm.*, figs. 3 and 4) which contain large oval nuclei, the latter exhibiting chromatin granules arranged near the periphery. One now finds a delicate membrane (*mbr. pr.*, Pl. iii., fig. 4) lining the whole interior of the wing-bags. This is the "grundmembran" of Semper (1857), who showed that it was produced by mesenchymatous cells, which applied themselves to the deep surface of the hypodermis, and sent out lateral processes, serving both to connect the cells with one another and to give them a stellate form. These stellate cells secrete an intercellular substance, filling up the interstices of the network formed by them, and this substance, together with the metamorphosed cells that produce it, finally become the thin structureless membrane to which Semper gave the name "grundmembran." This membrane is widely separated from the hypodermis as a whole, and the space between them contains lymph corpuscles in large numbers (Mayer). It appears to be probable that there are communications between the sub-hypodermal spaces and the chief lumen of the wing. At rather regular intervals the "grundmembran" of one wall becomes continuous with that of the other by means of hollow tubes (*tb.*, Pl. iii., figs. 3 and 4), formed by the folding of the membrane itself. The cavities of these tubes are direct continuations of the sub-hypodermal spaces of the upper and lower walls of the sac. Leucocytes are frequently found within the tubes. A slender thread-like prolongation of the hypodermis cells (*prc.*, Pl. iii., figs. 3, 4, 5) extends inward from each cell of the hypodermis to the "grundmembran;" each cell gives rise to only one, and occasionally a cell is seen without any, process. The wings at this stage are still little more than simple out-pocketings of the general hypodermis of the chrysalis. In fact, in the larva itself the general hypodermis of the body is lined on the inner side by a thin membrane, coincident in relative position with the "grundmembran" of the wings, and where this membrane is stretched, as in Pl. iii., fig. 9, the hypodermal cells send out processes which are connected with the membrane. This reminds us of the condition of the processes (*prc.*, Pl. iii., figs. 3 and 4) in the pupa.

The wings are filled with hæmolymph (blood), and this fluid contains blood corpuscles of different shapes (*leu'cy.*, *leu'cy.'*, *leu'cy."*, Pl. iii., figs. 3 and 4), some of which are vacuolated (*leu'cy.'*, Pl. iii., figs. 4 and 5) and appear to be corpuscles in the course of degeneration. Mayer supposes that these are the fat cells of Semper.

About three weeks before the insect will emerge (a less period, of course, in those species in which the pupal period is very short), "certain of the hypodermic cells (*cl. frm.*, Pl. iii., fig. 5), which occur at regular intervals, begin to be modified. They begin to increase slightly in size, to project a little above the level of the ordinary hypo-

dermis cells, and, most remarkable of all, to acquire each a vacuole." These modified cells are destined to give rise to the scales. They are the formative cells of the scales, the "Bildungszellen" of Semper. The evidence at present available tends to show that these scale-producing cells are hypodermal, and not mesenchymatous cells, that they are, in fact, modified hypodermal cells.

In the next stage the scale-producing cell (*sq.*) has already grown outward as a blunt process, which bends distad or towards the outer edge of the wing. The protoplasmic prolongations at the deep ends of the formative cells have nearly all disappeared. There is usually only one vacuole, occasionally there are two, in each of these cells (Pl. iii., fig. 12).

The pupal wing of *Aglais urticae*, three days after pupation, shows a slight advance in development on the above. The formative cells are quite large, and each contains several small vacuoles; they no longer exhibit any trace of protoplasmic processes.

At a slightly more developed stage (the pupa examined is that of *A. archippus*) the formative cells have greatly increased in size, and the vacuoles have entirely disappeared. The upward projections, which are to form the scales, have grown outward to a much greater extent than in the stage last described. The hypodermis is thrown into a regular series of transverse ridges (across the nervures), each ridge corresponding in position with a row of formative cells, and each furrow with the interval between two adjacent rows. As a consequence, the scales always project from the tops of these ridges. The "grundmembran" does not partake in the folding, and the deep processes of the hypodermal cells, that once extended to this membrane, have now disappeared (Pl. iii., fig. 13).

About eight days before the emergence of the imago of *A. archippus*, the inner cuticular membrane, which previously lay almost in contact with the hypodermal cells, has been pushed outward by the development of the scales (*vide.*, Pl. iii., fig. 7). The growth of a single scale at this period, separating the cuticular covering of the pupa, is shown in Pl. iii., fig. 6, where the scale *sq.* is seen in connection with the formative cell (*cl. frm.*) of the scales (*vide.*, Pl. iii., fig. 7). The protoplasmic processes which joined the hypodermis to the "grundmembran" (*mbr. pr.*) have disappeared, the latter being now nothing more than a simple homogeneous structure, with the appearance of a structureless membrane lying below the hypodermis (Pl. iii., fig. 7). At this, and, still better, at a little later stage of development, it is observed that the body of the large formative cells lies below the level of the ordinary cells, and sends a protoplasmic process upward to form the scale. This is well exhibited in Pl. iii., fig. 6. The scale at this stage is a minute flattened chitinous bag, filled with protoplasm, and whilst the scales remain full of protoplasm, they appear as transparent as glass, but when the protoplasm shrinks out of them they become whitish.

The hypodermal cells, although no longer separated by well-defined cell walls, are still well marked out by the peculiar arrangement of the finely granular contents of the cells. The hypodermis, too, has now begun to secrete the chitinous cuticula of the wing membrane; but it is as yet very thin, becoming much thicker as the wings develop. Each of the hypodermal cells, at this stage, gives rise to a new pro-

longation (*fbr. h'drm.*) from its base, which, piercing the grundmembran below it, traverses the lumen of the wing, pierces the grundmembran of the opposite side, and finally unites with the cuticula of the opposite surface of the wing (fig. 8, *fbr. h'drm.*), and thus every hypodermal cell becomes converted into a long, thin fibre, stretching from the upper to the lower surface of the wing, and the similarity of their appearance to muscular fibres suggests that they may be contractile; although Mayer believes that they, in time, become tendinous cords, serving to hold the opposite membranes of the wing together during its great expansion, directly after the exclusion from the chrysalis. Schäffer thought that these fibres were merely the original protoplasmic prolongations (such as are shown in Pl. iii., fig. 5, *prc.*) fused together, but he was quite unaware of the absorption of these prolongations, and the subsequent development of the fibres uniting the opposite membranes forming the wing.

In the scale itself, the protoplasm which fills the primitive scale undergoes contraction, and becomes coarsely granular, and gradually withdraws from the scale, leaving little chitinous pillars (*clm.*, Pl. iii., fig. 11) which bind the upper and lower surfaces of the scale together. Mayer says that the protoplasm is entirely withdrawn, and that the scales then become merely little flattened, hollow, chitinous sacs, containing only air. Chapman, however, dissents entirely from this view, and states that no air enters any of the scales until the pigment is fully elaborated. We have ourselves noted that the scales, at this so-called "white" stage, are very different in appearance from the opaque whiteness which characterises actually white scales filled with air, at the final stage of development. It appears that the scales, at this stage, are not filled with air, but are filled with a clear secretion from the hæmolymp, containing all the necessary materials for going through the chemical changes which result in pigmentation. The striations of the scale may be observed, at this stage, to be due to a series of parallel longitudinal ridges on the upper surface (Pl. iii., figs. 10-11), the under surface of the scale is provided with but few, and these ill-developed, ridges.

The next stage of development shows the wings of a yellow-ochre colour, for the secretion from the hæmolymp, which fills the scales, now begins to undergo the chemical changes, which result in pigmentation. The formative cells now show great change, and the formation of the scales being completed, and there being no further use for these cells in the economy of the insect, they undergo degeneration. At this stage, certain scales (? androconia) situated either upon the nervures or near the outer edges of the wing, have a leucocyte enter them; the pigmented scales contain no leucocyte.

The insertion of the scale into the wing membrane is brought about by the filling of the narrow cylindrical stalk of the scale into a minute close-fitting socket, which perforates the wing membrane (Pl. iii., fig. 10). It is not set into a tube, as Landois supposed, nor did Mayer discover anything resembling the "Schuppenbalg" described by Spuler, for the insertion of the scales.

The transverse folding of the wing membrane is very sharp, and the latter is, in fact, thrown into a very regular series of closely compressed folds (*cta. al.*, Pl. iii., fig. 10), a single scale being inserted on the crest of each fold. When the imago emerges from the chrysalis, the

hæmolymp (blood), within the wings, is under considerable pressure, and this would tend to enlarge the wing into an inflated bag; but the hypodermal fibres (Pl. iii., fig. 8), before described, hold the upper and lower walls of the wings together, and the bag becomes a flat, instead of an inflated, one. In *A. archippus*, Mayer points out that "the area of the wing of the imago is 8.6 times that of the pupa. The wing of the newly-formed pupa has about 60 times the area of the wing in the mature larva, so that it is evident that, in passing from the larval state to maturity, the area of the wings increases more than five hundred times."

(To be continued).

DESCRIPTION OF PLATE III.

- Fig. 1.—Longitudinal section through the left hind-wing of the mature larva of *Pieris rapae*. The plane of the section is parallel to the frontal plane of the larva, *i.e.*, perpendicular to its dorso-ventral axis.
- Fig. 2.—A portion of a cross-section of the larval wing of *P. rapae*.
- Fig. 3.—Longitudinal section (*i.e.*, with the trend of the nervures) through the pupal wings of *Samia cecropia*. The section is taken near the lower free edges of the pupal wing cases.
- Fig. 4.—Portion of a longitudinal section through the pupal cuticula and wing tissue of *S. cecropia*. Specimen killed in January.
- Fig. 5.—Portion of a longitudinal section through one of the young pupal wings of a chrysalis of *Eucanessa antiopa*.
- Fig. 6.—Portion of a longitudinal section through a pupal wing of *Anosia archippus*, about eight days before emergence.
- Fig. 7.—Portion of a longitudinal section through one of the pupal wings of *A. archippus*, about eight days before emergence.
- Fig. 8.—Portion of a longitudinal section through a pupal wing of *A. archippus*, about five days before emergence.
- Fig. 9.—Portion of a cross section through the mid-dorsal region of a larva of *P. rapae*, taken just back of the head, in the place where the cuticula splits when moults occur.
- Fig. 10.—Portion of a cross section (*i.e.*, perpendicular to the trend of the nervures) through the pupal wing of *A. archippus*, about six days before emergence.
- Fig. 11.—View looking down upon the upper (*i.e.*, exposed) surface of one of the large scales situated upon the nervures of *A. archippus*. Stage, about four days before emergence.
- Fig. 11a.—Leucocyte found within the scale represented by fig. 11, about four days before emergence.
- Fig. 12.—Portion of a longitudinal section through one wall only of the pupal wing of *F. antiopa*, slightly more developed than fig. 5.
- Fig. 13.—Portion of a longitudinal section (*i.e.*, parallel with the trend of the nervures) through the pupal wing of *Anosia archippus*, about eight or nine days before emergence.

ABBREVIATIONS USED IN PLATE III.

<i>a.</i>	anterior.	<i>leu'cy'.</i>	elongated spindle-shaped leucocytes.
<i>cl. frm.</i>	formative cells of the scales.	<i>mbr. ba.</i>	basement membrane of the larval hypodermis.
<i>clm.</i>	chitinous pillars found in scales.	<i>mbr. m.</i>	middle membrane of the larval wings.
<i>cta.</i>	outer chitinous cuticula of the larva.	<i>mbr. pr.</i>	Grundmembran of Semper.
<i>cta'.</i>	outer chitinous cuticula of the pupa.	<i>nl.</i>	nuclei of the stellate cells that secrete the Grundmembran.
<i>cta''.</i>	inner cuticula membrane of pupa.	<i>p.</i>	posterior.
<i>cta al.</i>	wing membrane.	<i>prc.</i>	processes of young hypodermis cells.
<i>fbr. h'drm.</i>	hypodermal fibres of pupal wings.	<i>sq.</i>	scale.
<i>h'drm.</i>	hypodermis.	<i>tb.</i>	tubes produced from the newly-formed Grundmembran.
<i>leu'cy.</i>	leucocytes.	<i>tr.</i>	trachea.
<i>leu'cy'.</i>	vacuolated leucocytes, as found in the very young pupa.		

On Lepidopterous larvæ.

By HARRISON G. DYAR, Ph.D.

Mr. Tutt has requested me to point out briefly the characters of Lepidopterous larvæ that are the most valuable in their classification. I have found these to consist in the positions of the tubercles or warts from which the hairs arise, not so much in the ultimate structure of the hairs, humps, horns, or other modifications. Considering only the abdominal segments, there are in the simplest and lowest condition, five hairs on each side, each arising from a simple tubercle. These are the five primary setæ—i. or anterior trapezoidal, ii. or posterior trapezoidal, iii. or supra-spiracular, iv. or posterior sub-spiracular, and v. or anterior sub-spiracular. There is also a tubercle on the base of the leg (vii.) which bears more than one hair, and a single-haired one (viii.) on the inner side of the leg. This condition may be found in the newly-hatched larvæ of some species of all families of the Lepidoptera, and also in the Mecoptera. In certain groups there is further a tubercle (vi.), situated above the base of the leg, which may appear after the first change of skin. I have called this a sub-primary tubercle. All these tubercles may become many haired (warts), or there may be developed more or less numerous hairs from other parts of the surface of the body (secondary).

The sub-order FRENATÆ (Comstock) divides into five great groups:—
 I.—*Butterflies*.—In the first stage the primitive five setæ are found. Tubercles iv. and v. are in line, or iv. is moved upward somewhat behind the spiracle. The principal characteristic of the group is that, after the first stage, all the modifications of armature, hairs, etc., are secondary, not corresponding exactly with the location of the primary setæ. II.—*Sphingids*.—In this group the first stage shows the primitive setæ, but v. is very regularly moved up before the spiracle. After the first stage, the setæ are obscured by fine secondary hairs or granules, somewhat as in the butterflies. III.—*Saturnians*.—In this and the following groups, the mature structures are developed from the primary tubercles, only in rare cases obscured by secondary hairs, and even in these cases the original tubercles have a persistent character, as shown by their appearance in earlier stages than the

secondary ones. The Saturnians are further characterised by the union of setæ iv. and v., below the spiracle, into a single tubercle, and the absence of the sub-primary tubercle vi. IV.—*Bombycids*.—Tubercles iv. and v. are remote, and iv. is moved up behind the spiracle, becoming the post-spiracular tubercle. Tubercle vi. is present. The group, as here defined, comprises the Bombycids, Noctuids and Geometrids. V.—*Tineids*.—As in the Bombycids, except that tubercle iv. is not moved up, being in line with v. or else united with it. The group includes Tineids, Tortricids, Pyralids, and a few small families, such as *Cossidae*, *Limacodidae*, *Zygaenidae*, *Sesiidae* and *Psychidae*.

The sub-order, *JUGATÆ*, needs further study. It comprises *Hepialus* and *Micropteryx*. The larvæ seem to be characterised by simple setæ, tubercle vi. absent, or replaced by a different set of sub-primary hairs, iv. and v. remote; but not enough material has been examined as yet. Careful descriptions of all stages of the larvæ of these genera are needed, with special reference to the number and positions of the hairs. The family *Thyridæ* has not yet been placed from larval characters.

For further details the following papers may be consulted:—Müller, *Zoologische Jahrbücher*, 1886, p. 417; Dyar, *Annals New York Acad. Sci.*, viii., 194 (1894); *Trans. N. Y. Acad. Sci.*, xiv., 49 (1895); *Journ. N. Y. Ent. Soc.*, iii., 17; *American Naturalist*, 1895, p. 1066; *Proceedings Boston Soc. Nat. History*, xxvii., 127 (1896).

Double-brooded Lepidoptera in 1896.

By E. F. STUDD, M.A., B.C.L., F.E.S.

During the season of 1896 I noted second, or unusually protracted single broods, of the following insects. There were, of course, many other common insects, normally second-brooded, which I did not consider worth noting at the time, and which I will not therefore include, not having their exact dates:—

Cyaniris argyolus.—Of this there was a fairly numerous first brood, which appeared about a fortnight later than usual, and a very numerous second brood, which I first noticed on July 5th. On July 12th and 13th, I saw a large number of ♀s flying low over the gorse, and constantly settling on it, as if seeking a place to oviposit. Do they ever do this on gorse? I could not find any ova, but then gorse is a very difficult and unpleasant plant to search. They seemed to have quite deserted the hollies, totally unlike the first brood, which kept high up among them, and rarely came within reach. I saw far more ♀s than ♂s of the second brood.

Drepana falcataria and *D. binaria* were taken in May, and again in August.

Leucania littoralis.—Of this insect I took several specimens, quite fresh, on Dawlish Warren, on August 25th. It was suggested, I think by the Rev. E. C. Dobrée Fox who had taken it at Tenby in June, that these would be insects of a second brood, and, judging from their condition, I should say he is right. *L. pallens*.—Newman and Stainton give June to August for this. I took it here in profusion at the end of August and in September. They had undoubtedly only just emerged, for they were in the finest condition, and it is an

insect which soon gets worn; but whether they were members of a second brood, or only late members of a single brood, I cannot say for certain, not having bred it. I find, however, that I took the insects on May 24th, and in June, and it seems to me a long period over which emergences of a single brood may be spread. I find that in 1895 also I took it quite fresh on September 19th, and this seems to be the usual thing here. I should think these September insects are the product of the May and June ones, especially as I find I have no record for it in July or earlier in August than a single specimen on the 7th, in 1896. *Habrostola tripartita*.—On May 25th and August 25th. *Phlogophora meticalosa*.—In April and September. *Arentia flexula*.—June 18th to August 4th. *Hyppa proboscidalis* was out early in June, and quite fresh till end of September. I should think there must have been two broods. *Ellopiopsis prosapiaria*.—Newman gives the date of this as "about midsummer," and Stainton, end of June and July. It was out here from May 28th to July 7th, and appeared again, an undoubted second brood, in September. *Selenia bilunaria*. The first brood appeared on March 12th, and a numerous second brood in August. *Cleora lichenaria*.—Appeared in May, and was taken, on and off, till August 18th. Whether there was more than one brood I cannot say, but the August ones were quite fresh. Then, again, a perfectly fresh ♂ was taken on October 3rd. I suppose the May and June insects were precocious emergences from the ordinary July brood, and a few of their larvæ produced a small brood in October, or the latter end of September. *Boarmia gemmaria*.—June 6th to August 19th. *Tephrosia bistortata*. A very numerous and early second brood occurring from June 19th to middle of August. *Zonosoma porata* and *Z. linearia*.—In May, and a second brood in August and September. *Acidalia marginipunctata*.—I took a few on August 18th and 25th, but cannot say whether they were a second brood or not. I see Newman and Stainton give June and July, but in such an early season, probably, it was out by May, and would hardly have lasted till August quite fresh. *A. imitaria*.—Newman gives August 14th only as date of a bred one. Stainton, July and early in August. I took it at the end of May, in June (12th, 15th and 30th), in July (13th and 15th), in August (5th and 18th), and September 3rd. I think there must have been two broods, undoubtedly, as the late ones were quite fresh, and it is an insect which wears directly. *A. aversata*.—In June and September. *Macaria liturata*.—Newman and Stainton give July. It occurred here in May, and again, probably a second brood, on August 19th and September 5th. *Aspilates ochrearia*.—Occurred in May, and a second brood in August and September. *Larentia viridaria*.—Newman gives "throughout June and part of July;" Stainton, "June and July." It appeared here at end of May and in June, and again on September 8th. I find, on reference to previous years, that this insect normally appears here in June, and again at end of August and in September (e.g., September 16th, 19th, 20th, 1895). *Emmelesia affinitata*, *E. alchemillata* and *E. decolorata*.—These were all out from first week of May to middle of July, and *E. affinitata* occurred again quite fresh in August (e.g., 12th). *Eupithecia nanata*.—Newman and Stainton give May. Here it is normally double-brooded, appearing from middle or end of April to middle of June, and again in August (e.g., August 28th, 1894, August 8th, 1896). *E. pumilata*.—I cannot

say how many broods of this there may have been, but I took it fresh in April, May, June, July, August, September, without any break, and full-fed larvæ on August 11th. *E. coronata*.—May 13th and July 19th. *Lobophora viretata* was very numerous in May and early June, and a second brood appeared in August (1st, 13th, 14th, 18th). Newman and Stainton only give May and June. *Thera variata*.—In May (5th) and early June, and again in September and October (September 17th, October 4th). This is the normal thing here. Newman says, "during the summer months," and Stainton gives June to September, as if there was only a single brood. I do not appear, however, ever to have taken it in July or August, and I should suppose it is regularly double-brooded, in spring and autumn. Stainton seems to imply this when giving the time of appearance of larva as March to May and July. *Hypsipetes trifasciata*.—Newman says: "May, and, according to Guenée, also in July and August." Stainton gives May only. I can confirm Guenée, having taken it last year on July 11th, fresh as bred. *Melanthia ocellata*.—Newman gives June; Stainton, June and July. I got it here in May (6th) and early June, and again in August and September (August 18th, September 6th). I find, on referring, that I ordinarily get it here twice a year, in these months—very rarely in July (July 21st, 1891). *M. sociata*.—Earlier than usual—April and May (April 17th, May 5th, and again towards end of June). *M. galyata*.—Newman gives June; Stainton, June and July. It appeared here in May (11th), and again in August and September (August 16th, September 6th). *Coremia designata*.—In May and August last. *C. ferrugata* and *C. unidentaria*.—I am unable to distinguish red *C. unidentaria* from *C. ferrugata*, so call all red specimens "*ferrugata*," and all dark ones "*unidentaria*." The red occurred in April (20th) and July (14th), the dark in May (2nd) and June (10th), and again in August (8th). *Cidaria truncata*.—In May (6th) and June, and again in August (6th) to October (9th). *C. silaceata*.—In May (6th) and July (9th), and August (6th). *Eubolia plumbaria*.—From May (6th) till August (2nd). *Mesotype virgata*.—Newman gives May and June; Stainton, May to July. On Dawlish Warren, near here, it is always to be got in August, I should suppose a second brood, as they are quite fresh. I got it last year on May 7th, and August 7th and 25th. *Anaitis plagiata*.—Newman gives the times of appearance correctly as May, and August and September; but Stainton gives June to August, as if there was only one brood appearing in June, July and August, which is very misleading. The latest date I can find in my notes for first brood is June 7th (1890), and the earliest for the second is July 27th (1893). These are the only records I have for June or July. *Scoparia mercurella*.—June (12th), and August (6th), and September (8th). *Dictyopteryx loeflingiana*.—On and off, from June 3rd to September 17th. *Tinea semifulvella*.—Stainton only gives June. Here this insect is normally double-brooded, occurring in May and June (the latest entry I have, June 19th, 1895), and in August and September (earliest entry August 8th, 1894). It occurred freely from May 5th to 29th, and again in September (7th and 15th). *Gracilaria alchimiella*.—In May (7th) and August (10th).

In the above notes I have ventured to correct what appear to me to be inaccuracies in Newman and Stainton. Possibly many of these

may have been noted in the magazines already. If so, I must apologise for the repetition, owing to my ignorance. As against these second broods I noticed none of *Drepana cultraria*, *Selenia lunaria* or *S. tetralunaria*, which are said to be double-brooded. Of *D. cultraria* and *S. lunaria* there were unusually numerous first broods. I have never myself come across the second of either. (The same remark, however, applies to *D. falcataria* and *D. binaria* until last year.) Of *S. tetralunaria* there was a very numerous second brood in 1894, but I have not come across any second brood of it since. I got a few first brood specimens in March, 1896.

Contributions to the fauna of the Dauphiné Alps.

VI.—DESCRIPTION OF A GELECHIAD NEW TO SCIENCE.

By the Rt. Hon. LORD WALSLINGHAM, M.A., L.L.D., F.R.S., etc.

TINEINA. — GELECHIADÆ. — MEGACRASPEDUS, Z. — *Megacraspedus tutti*, Wlsm. sp. n. — *Antennae* minutely biserrate; mouse-grey. *Palpi*: apical joint erect, slender, naked; second joint thickly clothed with a long projecting tuft, reaching more than the length of the apical joint beyond its base; pale cinereous, shaded with mouse-grey externally. *Head* whitish cinereous. *Thorax* mouse-grey, somewhat paler in front. *Fore-wings* elongate, narrowly lanceolate; mouse-grey, with very faint indications of paler lines following the neuration—these are scarcely distinguishable except along the upper margin of the cell; costa narrowly whitish from the base to the middle of the costal cilia; cilia brownish cinereous. *Exp. al.* 18 mm. *Hind-wings* pale-grey; cilia brownish cinereous. *Abdomen* dark brownish-grey. *Legs* pale cinereous; hind tibiae hairy.

Type, ♂ Mus. Wlsm.

Hab., FRANCE — Dauphiné—La Grave, 5,000 ft. VIII. 1896. (J. W. Tutt—two specimens).

With the exception of *evolellus*, Ersch., from Turkestan, I am fortunate in possessing specimens of all the described species of this genus, and I have no hesitation in recognising this species as quite distinct from any of them. It is decidedly darker in colour than *dolowellus*, Z., to which it appears to be nearly allied, although the wings are somewhat longer in proportion to their breadth, and the pale lines which forcibly remind one of the genus *Coleophora*, Hb., are in this species almost obsolete, whereas in good specimens of *dolowellus* they are plainly visible. In shape it agrees more nearly with *subdolowellus*, Stgr., from Andalusia, which is, however, much paler; and, indeed, none of the known species of the genus possess the dull mouse-grey colouring, which resembles more nearly that of *Paltodora striatella* (Schiff.), Hb., but with perhaps an even fainter admixture of brown.

VII.—THE MOTHS OF BOURG D'OISANS.—IS EMYDIA CANDIDA CO-SPECIFIC WITH E. CRIBRUM?—LITHOSIA LUTARELLA AND ITS VAR. PYGMEOLA —DIANTHOCIA CAPSOPHILA IN DAUPHINÉ—DARK ABERRATIONS OF BRYOPHILA PERLA.

By J. W. TUTT, F.E.S.

The moths of Bourg d'Oisans were particularly interesting from the British point of view, so many species that are extremely localised in Britain being here found, as it were, also in a very restricted area. There was nothing startling, although one felt that a fortnight or

three weeks earlier would have produced better results. Still, the number of species was large and, in themselves, not uninteresting.

SPHINGIDES.—*Macroglossa stellatarum*.—Evidently just emerging, a few specimens were captured, apparently just out of pupa. They affected flowers, not walls.

SATURNIDES.—*Saturnia pyri*.—A few larvæ were brought into the hotel, in the yellow stage (just preceding pupation), and mostly injured. They were, from their colour, evidently the victims of accident, whilst in search of a pupating place.

LASIOCAMPIDES.—*Clisiocampa neustria*.—The males of a pale yellow or buff form came up freely to light one evening. A specimen of *Gastropacha quercifolia* (?) came also on the same evening.

CHELONIDES.—*Callimorpha hera*.—This species was not really common, although specimens were met with here, there and everywhere. They were in fine condition, and, as usual, hanging on flowers, from which they started off swiftly when disturbed. All the specimens were of the red form, neither ab. *lutescens* nor ab. *saturnina* putting in an appearance. *Nemeophila russula*.—A few male specimens were disturbed. These were evidently freshly emerged, but in such small numbers, that we suspect this second brood is only very partial as to numbers, although very general as to appearance in this district at low elevations. *Eulepia cribrum* ab. *candida*.—We are beginning to doubt whether *candida* really is co-specific with *E. cribrum*. It has a wide range in Dauphiné and Piedmont, and appears to exist from an altitude of 2,500 to 6,000 ft. Only two or three specimens were captured here. *Lithosia lutarella* var. *pygmaeola*.—We are astonished to see (*Brit. Lep.*) that Mr. Barrett is one of those who doubts the specific identity of these insects. We are not aware whether he has ever seen either or both forms alive. At Bourg d'Oisans this species came to light, to the hotel windows. All the specimens were quite typical *pygmaeola*, except one, and might have been captured on the Deal sand-hills; the one exception was a very good intermediate between the golden *lutarella*, from the higher Alpine regions, and the pale var. *pygmaeola*. This capture of the type at Bourg d'Aru and in the lower part of the Cogne Valley, fixes the range of the type at above 4,000 ft. elevation. The species flew by day, and also came to light at night. *Lithosia complana*.—Not uncommon on flowers by day, also came to light. The specimens are exceedingly pale grey, with the costa very pale yellow; in one (ab. *pallida*, nov. ab.) the specimen is of such a pale grey ground-colour, and the costal streak so nearly white, that one might easily suspect the specimen to be *L. caniola*. These are very different from the Tyrolean (Mendel Pass) specimens, which have very dark fore-wings, but have none of the dark shading that characterise our "Moss" var. *sericea*. *Lithosia lurideola*.—Almost typical, although a little pale. This also was found on the flowers by day, and came to light. *L. unita* ab. *flaveola*.—Two specimens appear to be referable to this form, as diagnosed by Staudinger: "al. ant. flavis, al. post. unicolor." Staudinger records this aberration from "Spain and Hungary." We have also taken it in the neighbourhood of Aosta, so that France and Italy must be added to the distribution of this form. *Naclia ancilla*.—One specimen only came to light. We did not, therefore, learn anything beyond this of the habits of this little species.

LIPARIDES.—*Porthetria dispar*.—The males were flying in the greatest profusion in the hot sunshine, in one steep gully, at a short distance from the hotel. They were also pretty generally distributed wherever the trees were a little thick. Many examples came to light, all males. The specimens captured here, as at Bourg d'Aru and Aix-les-Bains, were very small, and quite different from the huge Grenoble examples.

NOCTUIDES.—*Hadena dissimilis* ab. *w-latinnum*.—One very fine specimen of this dark aberration came to light. Evidently there is a partial second brood of this species, as with us. *Dianthoccia capsophila*.—A worn, rather brownish, but unmistakeable specimen of this species, captured by day in a lucerne field. *Hadena trifolii* (*chenopodii*).—One specimen only, disturbed in a lucerne field during the day. *Hadena rubirena*.—One fine specimen, at light. *Apamea lateritia*.—One specimen, at light; rather grey in colour. *Caradrina taraxaci*.—One worn specimen, also disturbed on the borders of a lucerne field, by day. *Noctua plecta*.—One specimen, evidently of second brood, captured at light. *Agrophila trabealis*.—Not uncommon, on a piece of ground overgrown with grass and wild flowers. Its short, jerky flight, when disturbed, was unmistakeable; but we were surprised to find it so restricted here. The specimens were much darker than our Suffolk examples. *Heliothis dipsaceus*.—A few specimens only captured, flying by day, in the lucerne fields. This insect is regularly double-brooded in the Paris environs, the second brood occurring in early August, at Bagneux, so that, although the Bourg specimens were in good condition, probably the bulk of the emergence was over. *Bryophila perla* ab. *suffusa*.—A most interesting form, darker than anything we had seen before, with the exception of a specimen or two from the Mendel Pass, in which, however, the dark coloration was mixed with orange. We could not find the walls they frequented, or at any rate, we could not find the moths on the walls; perhaps they were too well protected. Those captured were attracted by the light.

DELTOIDES.—*Hyppena crinalis*.—One specimen only, and that worn.

NYCTEOLIDES.—*Sarothripa undulans* (*verayana*).—Two forms were captured, at light: (1) Dark grey, almost unicolorous, the basal and costal spots reddish, and only faintly marked. (2) Pale grey, with dark, conspicuous basal and costal markings.

(To be continued.)

Are *Tephrosia bistortata* (*crepuscularia*) and *T. crepuscularia* (*biundularia*) distinct species?

By WILLIAM HEWETT.

(Continued from p. 109).

In the discussion already alluded to (*Ibid.*, p. 305), Mr. Tutt refers to the *Tephrosia* from Perth, as being specifically identical with the southern *T. bistortata*, and says:—"It seems to me remarkable, and worthy of notice, that so far north, where *T. bistortata* is single-brooded,* a small percentage of the progeny apparently assumes the

* Mr. Tutt has since bred the Perth insect, and has obtained second-brood specimens.—ED.

size and superficial resemblance of our southern July brood (*i.e.*, *ab. consonaria*, St.).” I think Mr. Tutt is in error in referring those Perth specimens to *T. bistortata*,† for the following reasons:—(1) The date of emergence, which is that of *T. crepuscularia* (*biundularia*). The earliest dates on which this form has been noticed are April 28th (Lawson), April 10th (Bush), April 28th (Wylie). Mr. Lawson states the species to be in its prime from May 5th to 10th; Mr. Wylie, from May 4th to 10th. These dates‡, in my opinion, establish beyond a doubt the identity of the species with *T. crepuscularia*. (2) I consider them to be *T. crepuscularia*, because the Perth insect is always single-brooded, a striking characteristic of this species, and one that rarely occurs with *T. bistortata*, which is generally double-brooded in the localities where it occurs.

At my request, Messrs. Kane and Riding have very kindly given me their views as to the Perth specimens, I having previously submitted specimens for their examination. Mr. Kane says:—“As to the Perth forms, I find myself much perplexed. The two submitted agree with many of the ordinary forms of *T. bistortata*.” Dr. Riding writes:—“For those who hold, as I am inclined (from the Perth specimens I have seen), that the Perth insect is *T. bistortata*, there seems no other explanation than that the latter must have spread themselves as far as Perth, where they found a suitable environment, whilst those in the gap between Perth and their southern habitats lost their foot-hold, owing to subsequent changes and unsuitability. To my mind it is much more reasonably accounted for by considering *T. bistortata* to be the original stock, and the Perth forms a reversion, under local conditions, from the northern *T. crepuscularia*, formerly a variety of *T. bistortata*, but now established as a separate species.”

Having now reviewed, although briefly, the principal points of interest in the discussion carried on in the *Entom.*, 1886, I will now refer to the material collected from the 58 British lepidopterists, in answer to questions which I asked, and which were printed in the *Entom. Record*, viii., pp. 236–237. To mention all these gentlemen by name would be superfluous, and the material has assumed such gigantic proportions, that I can only comment upon the most important points.

The first of these refers to Mr. Arkle’s belief that there are two broods of *T. crepuscularia*, “at least in some seasons,” in Delamere Forest, where, it would appear, only the *ab. delamerensis* occurs. I do not agree with him in thinking that the dates furnished by him, *viz.*, April 20th to June 13th, prove the existence of two broods, but am convinced that they are only examples of protracted emergence. Mr. Arkle’s dates agree with mine for the appearance of the York specimens, *viz.*, April 4th to June 13th, and here there is certainly

† These are nearer to the Continental type of *T. bistortata* than any other British specimens. Our ordinary ochreous southern form = *ab. abietaria*, Haw. We are pleased to see that Messrs. Kane and Riding came to, what we consider, a correct conclusion on two specimens.—En.

‡ Surely these dates suggest exactly the opposite. Mr. Young (see footnote p. 108) gives “from the middle of May to June 10th,” as the best time for *T. crepuscularia* in York. Perth is 2½ farther north, and the localities for *T. bistortata* are distinctly Alpine. The larch woods of Kinnoull Hill and Kinfann are at a considerable elevation, and Burnham Hill (15½ miles north of Perth) has an elevation of 1,324 ft.—Ep.

only one brood. The dates given by Mr. Young—end of March to July 29th—are certainly somewhat of a poser, but these dates are, undoubtedly, for very early and very late seasons, and are not normal. Mr. Young states that there is no interval in the emergence, and that he believes, as the result of long experience, that there is only one brood, and this is my own opinion. Mr. Kane asserts, without hesitation, that the Irish specimens, which emerge from April to June, are all to be referred to one brood.

A distinct interval between the emergence of the first brood of *T. bistortata* and *T. crepuscularia* is mentioned by Mr. Porritt. This does not, in reality, seem to exist, as my notes prove. Mrs. Bazett's second brood (wild) of *T. crepuscularia* (*biundularia*) is possibly referable to *T. bistortata*, with which the specimens seem to correspond. Mr. Fenn states that the two species occur at different times of the year. This statement is only partially correct, as several gentlemen record their occurrence together, and will not dispose of the cross-breeding. Mr. Fenn asks whether it is possible that there can be two forms or races of one insect appearing in the same district, one of which is in the larval state and nearly full-fed, whilst the other is on the wing. Mr. Tutt states, in a letter dated April 19th, 1896:—"It would appear that the discussion ten years ago, in the *Entomologist*, landed us about as far as we are likely to get. Evidently it (*bistortata*) is a species still in process of development." Mr. C. G. Barrett, writing on April 17th, 1896, says:—"I thought that the subject was about thrashed out."

Now, having gone through the whole of the controversy, I fail to find anything that would warrant such an assumption as that made by Mr. Barrett. Indeed, I am convinced that most of you will agree with me, that the controversy, and subsequent remarks thereon by Messrs. Barrett and Briggs, only made the confusion worse confounded. That Mr. Tutt thinks that there was more to be said is proved by his "Critical resumé of the arguments for and against *T. bistortata* and *T. crepuscularia* being considered distinct species," the published part of which I have read with much interest, whilst all lepidopterists owe a deep debt of gratitude to Mr. Prout for the masterly manner in which he has dealt with the intricacies of the synonymy of these two species (*Ent. Rec.*, viii., pp. 76-81).

With regard to the variability of both species, Mr. Adkin says that "both are variable." Mr. Lawson says the Perth specimens "vary little, but females are lighter than males." Mr. Bush states that the Perth specimens "vary considerably," and Mr. Wylie says that the "males are generally darker than the females, and vary much." Mr. Kane says that "the Irish specimens do not vary much, except in size." A peculiar banded form is taken by Mr. Mason, of Clevedon, and is only recorded from that locality. Messrs. Mason, Prout and A. Jones say that *T. bistortata* varies the more, whilst Messrs. Nesbit and Fenn say that *T. crepuscularia* (*biundularia*) varies the more.

(To be continued).

Notes on the Cocoon and Pupa of *Saturnia pyri*.

By A. BACOT.

COCOON AND PUPA OF *SATURNIA PYRI*.—A larva of *S. pyri*, which I received from Mr. Tutt, spun up among the twigs of its food-plant,

but a second cocoon given to me by Mr. Tutt was attached to a piece of crumpled paper. This cocoon was $2\frac{1}{4}$ inches long, and of a deep brown colour, very similar in shape and construction to that of *Saturnia pavonia*, except that it is longer, narrower, and has not so pronounced a neck as the latter. It is composed of very hard and tough silk, which cuts like thin horn. The outer surface is rough, covered with a thin coating of stout, wiry silk threads. The interior has a smooth glazed surface, two separate coats of the viscous silk having apparently been used in its construction. This can be best seen by opening the cocoon lengthwise. The opening, like that of *S. pavonia*, is constructed on a similar principle to that of a crab or lobster foot, with the exception that it prevents ingress and not egress. In the cocoon of *S. pyri* this trap is double, a distance of about $\frac{1}{3}$ of an inch separating the outer from the inner. The cocoon of *S. pavonia* also has remnants of an outer trap, but it is imperfect, being little more than an opening with ragged edges, while the inner is even more perfect than that of *S. pyri*. The pupa is that of a ♂; it is a shade less than $1\frac{1}{2}$ in. in length, and about $\frac{5}{8}$ in. in width, across the 4th abdominal segment, just at the end of the wing cases. *Colour*.—The 4th to the 8th abdominal segments, also the wing-, antenna- and leg-cases, and ventral surface of the head, are deep red. The thorax, dorsal head-piece and dorsal portion of all the segments to the 3rd and upper portion of 4th abdominal segments, are deep brown—almost black; the thorax, and two small plates on either side, being rather lighter (redder) than the other parts. The antenna-cases are very wide and large, showing the line of the central shaft and lateral pectinations clearly. The *spiracles* are large and very dark. The *abdominal segments*, 5, 6, 7 and 8, are well marked (incisions deep), but compressed ventrally. The *surface* is rough, and has a dead appearance (no polish), the incisions having a slight bloom on them. Traces of the *sexual organs* can be easily seen, but, on account of the compressions of the anal segments ventrally, it would be difficult to say of which sex the pupa is, without the antenna as a guide. The ventral surface of the 10th abdominal is very rough, and, at its extremity, slightly hollowed on the dorsal surface. It is slightly extended, forming a low double *cremaster* with a few short scythe-shaped spines on it. In this last feature it resembles the pupa of *S. pavonia*, except that, in the latter, the ventral hollow and *cremaster* are developed to a far greater extent. It, however, differs greatly in shape from the pupa of *S. pavonia*, which is much flattened out laterally, curved ventrally, and tapers rapidly towards the head and anus. The pupa of *S. pyri* is, in shape, almost, if not quite, cylindrical, tapers only very slightly to the shoulders (base of wings), and then abruptly to head, forming a blunt front. It tapers more evenly towards anus, which is rather blunt, and does *not* curve up ventrally as the pupa of *S. pavonia* does, though the segments are somewhat compressed ventrally. The pupa of *S. pyri* is not unlike that of *Smerinthus tiliæ* in shape, only rather wider in regard to its length, and, of course, differing at head and anus. In general shape and appearance, omitting the antenna-cases, it tends rather towards the Smerinthid than the Saturniid shape, as typified by *S. pavonia*. Some pupa-cases of a large South African Saturniid moth, that I have received, are very similar in shape to the pupa of *S. pyri*, with the

exception that the abdominal segments 5, 6, 7 and 8 are ridged at the lower edge, and the cremaster is reduced to a blunt point, with very stout pyramid-shaped projections on it. In fact, the cremasters of this species,* *S. pyri*, and *Endromis versicolor*, form a very good series of connecting links between the anal spike of the *Sphinx* pupa and the bristly cremaster of *S. pavonia*. The order will be as follows: *S. pavonia*, *S. pyri*, *E. versicolor*, the South African Saturniid and the Hawk moths, *e.g.*, *Smerinthus* or *Acherontia*.

* I have been unable to name this species yet. It does not appear to be in the National Collection.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

DESCRIPTION OF EGGS OF LEPIDOPTERA.—*Dianthoeicia luteago* var. *barrettii*.—The ovum is of a honey-yellow colour when freshly laid, globular, but somewhat flattened equatorially in shape, and the micropylar area slightly depressed, which disappeared as the embryo developed. Under a low power, they exhibited minute pittings, diverging in rows from the apex. The larvæ were discernible within the transparent pellicle in eleven days, fully developed, and emerged next day.

Stilbia anomala.—The ovum globular, viewed from above; from the side, the base is flattened, and the apex bluntly conical. Orange in colour, and strongly ribbed, the ribs radiating from the apex.—W. F. DE V. KANE, M.A., F.E.S., Drumreask House, Monaghan.

Neuronia popularis.—A ♀ taken at light on evening of Sept. 6th, 1896, deposited a few ova, singly, in collecting box. When fresh they were of a pearly straw colour, subsequently (? on formation of larva) turning leaden, which colour they were to the naked eye, with a darker spot in centre, when described. Under a lens the shells were seen to be transparent, and the larvæ could plainly be seen inside, fully formed, ready for hatching, being of a metallic green colour, and thus giving the eggs an iridescent appearance. In shape, like an apple or an orange, from which about $\frac{1}{5}$ of the height has been cut off at the bottom, forming a slightly concave base, and which (the orange) has been pressed down from above to form the micropylar depression, thus causing the circumference to bulge (? = depressed sphere). The height about equals, and, in some instances, slightly exceeds, the diameter of the base. Thickly ribbed longitudinally from the centre of the micropylar depression to and into the concave base, the ribs and interspaces being of about equal width. [The description was made on March 9th, 1897].—E. F. C. STUDD, M.A., F.E.S.

Catocala nupta.—Eggs laid on the flat surface of the box, slightly imbricate. The base is flattened, and the egg forms a very depressed cone in shape, the apex (the micropylar area) being flattened. The colour of the egg is pale creamy-grey, with dark purplish markings (due to embryo within). There are about 36 slender prominent vertical ribs, very shining and silvery on the ridges, uniting in twos or threes (although some remain single) on the shoulder of the egg, so that about 15 or 16 run on to the micropylar area. The micropyle is conspicuous, stellate, somewhat rosette-like in appearance, formed of irregular, quadrilateral cells outside, and smaller, more rounded cells towards the centre. These are arranged concentrically. There

are a very large number of slender transverse markings (hardly ribs) running very closely and parallel to each other round the egg, becoming conspicuous where they cross the longitudinal ribs, and less so in the depressions between. Twenty-five of these may be counted between the micropylar area and the equator of the egg. The junction of the vertical ribs on the shoulder of the ring suggests a transverse ring or ridge in that area under a low power, but this disappears when the egg is mounted under a two-thirds lens. [Eggs received from Mr. Bacot, and described April 12th, 1897, under a two-thirds lens].

Catocala fraxini.—Five eggs were examined, laid on each other, their appearance suggests that in nature they would be laid slightly imbricate, as in *C. nupta*. The shape shows considerable difference from that of the egg of *C. nupta*. It has a rounder base, is less flattened, and becomes somewhat echinoid in appearance. The apex (micropylar area) is flattened. The colour of the egg is orange- or greenish-yellow, with bright primrose and dark purple markings (= embryo). The vertical ribs prominent, with acute edges, which are silvery in appearance. They vary in number, 22 and 27 being counted in two different eggs, and of these four and eight respectively did not reach the micropylar area. The ribs stop short on the shoulder, and do not unite as in *C. nupta*. The micropyle is very beautiful, forming a very delicate rosette, the cells composing it having silvery-looking partitions. These cells are larger on the outside, and gradually decrease as they near the centre, where they are exceedingly minute. There is a very conspicuous primrose-coloured segment of a ring running round the egg for about three-fourths of its circumference. This is differently situated in different eggs, and is probably a structural part of the embryo, so that its position changes with that of the embryo. [The eggs were sent to me by Mr. E. Harrison, and described April 12th, 1897, under a two-thirds lens].

Polygonia egea.—Three eggs examined. Laid singly on a rib on underside of leaf of *Parietaria*; not unlike a green gooseberry or mountain-ash berry in shape. Green in colour, matching well with that of the leaf. Vertical ribs run pretty regularly from base to the edge of the micropylar area, where they end somewhat abruptly; these ribs are silvery in colour, prominent, and of very delicate structure. The space between ribs finely striated transversely, but the striations do not partake of the nature of ribs. The vertical ribs vary in number, the three eggs examined give 9, 9 and 10 respectively. The vertical ribs terminate on the margin of the micropylar area, the micropyle proper forming a little green button at the base of a somewhat shallow apical depression. The cells are very minute, somewhat rounded, and the whole of the depressed area has a very finely reticulated appearance. The central micropylar button is slightly elevated and rosette-like. The green coloration is distinctly of two shades within the egg, suggesting that the latter is undergoing development. [Eggs sent by Dr. Chapman, from Cannes, on April 6th, 1897. Described under a two-thirds lens, on April 12th].

Dasyampa rubiginea.—The newly-laid egg is of a pale yellow (creamy) colour, with the vertical ribs, from base to micropyle, exceedingly shiny. To the naked eye, the colour changes run in sequence—yellow, orange-red, reddish-brown and purple, as the development of the embryo proceeds. Under the microscope, how-

ever, these colours are broken up into various hues, the disposition of the colours, as a result of the embryonic development, continuously undergoing re-arrangement and distribution. Successive eggs examined give the following results:—(1) Almost uniform reddish-brown, with pale apex. (2) Pale at apex and base, orange-red centrally. (3) Creamy base, apical half blackish-grey. (4) Purplish, with creamy ring round the shoulder of the egg. (5) Purplish-red, much mottled, suggesting strongly the mottling shown in the *Acronyctid* eggs, figured by Dr. Chapman (*Ent. Rec.*, vol. ii., pl. 7 and 8). The egg is of the typical *Noctuid* shape, about three-fourths of a compressed sphere, with 27 conspicuous longitudinal ribs running from the base towards the apex. Of these, 13 reach the micropylar area, the others terminating just before attaining so far. Theoretically, the ribs should be alternately long and short, but practically the arrangement is not quite constant; occasionally two short ribs are adjacent, and more rarely two long ones. A number of fine transverse ribs (twelve between the micropylar area and equatorial region of egg) surround the egg parallel with the base, and where these cross the longitudinal ribs, the latter get a wavy appearance in the upper part of the egg, whilst lower down, in the equator of the egg, the points of section of these two sets of ribs are distinctly knotted. The micropylar area is small, and is banded by a circular ridge formed by the union of the longer longitudinal ribs, which, however, sub-divide before uniting to form its margin. The micropyle proper forms a tiny raised rosette (remining one of the appearance usually given in pictures to a sea-anemone with its tentacles retracted) placed quite centrally in the space within the circular ridge. [Eggs received from Mr. Mustace R. Bankes. Description made April 30th, under a two-thirds lens].—J. W. TUTT.

ON THE TRAPEZOIDAL TUBERCLES OF SATURNIA.—I made the following note on a young larva of *S. paronia* last May: The anterior pairs of trapezoidals are developed to an immense size, and bear numerous hairs; the posterior pairs are very small, in fact, they can only be seen with the aid of a microscope, and do not, so far as I can see, bear any hairs. This is also the case with the trapezoidals of the larva of *Bombyx mori* in its 1st skin, the anterior trapezoidals being large and bearing four hairs, while the posterior pairs are very small, and only bear one hair. This can be best seen on 1st abdominal. I also noted that I could just make out a downy appearance which I took to be a coat of spicules. Are not the lateral flanges a feature in the larva of *Aglia tau*?—A. BACOT, Bow House, Croydon.

COCOONS OF CRANIOPHORA LIGUSTRI ON PRIVET.—With regard to your note (*ante*, p. 43), I used to take *C. ligustri* in my father's garden freely in the "sixties." It there fed on privet. There was a privet hedge bordered by a stone wall. The larvæ were abundant on the privet, and the pupæ, in tough, but not hard, cocoons, under the "toppers" of the wall.—(REV.) E. HALLETT TODD, M.A., 2, All Saints' Villas, Cheltenham.

SITE FOR COCOONS OF GNOPHRIA RUBRICOLLIS.—I used to obtain the pupa of this species in a slight cocoon, surrounded by an outer covering of spider-like web, under the "topper" of a stone wall which surrounded a fir plantation (larch, spruce and Scotch); the larvæ feeding on the lichens of these trees, and probably on the lichens of hawthorn which hung over the wall.—IBID.

FORCING LASIOCAMPA RUBI.—I had a small batch of ova last June; they hatched on the 17th, and I sleeved them on a willow tree in my garden; they were full-fed by the end of September. I then put them into a cage and kept them supplied with fresh willow, but they only nibbled a little now and then. At the commencement of October they all went under the rubbish at the bottom of the cage. I kept them out of doors until the end of December, when I obtained a large bunch of heather, put it into a jar of water, placed it in the cage, and brought them indoors. I placed them near the oven in my kitchen, when they very soon got lively, crawling about on the heather. By January 3rd, several had spun up, but two did not spin up until February 4th. On February 14th, I had the first emerge, one ♂ and one ♀, another ♀ on the 20th; altogether I have had a dozen perfect specimens.—W. E. BUTLER, Hayling House, Reading.

Some further notes *re* *T. bistortata* and *T. crepuscularia* (*biundularia*).

By W. S. RIDING, B.A., M.D., F.E.S.

My first *T. bistortata*—from 2nd brood, Clevedon parentage, 1896—emerged on February 17th, 1897 (one from Clevedon, 1st brood, came out on February 15th), and continued to do so till March 27th. During the winter, they, as well as other pupæ alluded to further on, had been kept out of doors under shelter, and were brought into a cold room facing N., about the middle of February. Only a few ♀s, which were used for pairing, appeared with the ♂s for the first ten days.

A ♂ *T. biundularia* var. *delamerensis* emerged on February 26th, but few came out before March 9th, when a ♂ *T. biundularia* appeared, and both continued doing so freely till the end of the 2nd week in April, a few stragglers showing themselves as late as April 27th. The first ♀ var. *delamerensis* appeared on March 11th, and the first ♀ *T. biundularia* on March 14th. These were the imagines of pupæ bred from ova laid by a ♀ var. *delamerensis* from the York district, which hatched May 30-31st, 1896. The *T. biundularia* are more spotted with blackish-brown than our southern specimens, and the fact that both were produced from the same batch of ova, shows that inter-breeding is going on between the type and the variety. Probably, however, all these *T. biundularia*, when not marked var. *delamerensis*, are more or less "intermediate" vars. approaching the type, but there is no regular gradation between the two.

A cage of *T. biundularia* pupæ, reared from the ova of a ♀ *T. biundularia* from the York district, which hatched June 3-4th, 1896, was brought into a warm study towards the end of February, as well as another cage with some of the pupæ of var. *delamerensis*. These began to emerge on March 7th, and continued to do so till the end of the first week in April; the ♂s being a week or ten days in advance of the ♀s for the most part. Both produced the type (or intermediates) as well as the variety in nearly equal proportion (with a slight preponderance of *T. biundularia* from the pupæ of the ♀ *T. biundularia*) just as the unforced pupæ did.

Reciprocal crosses were made, besides pairing similar insects, with the following results:—

DATE OF PAIRING.	♂ PARENT.	♀ PARENT.	OVIPOSITION.	DATE OF HATCHING.
Feb. 18	<i>T. bistortata</i>	<i>T. bistortata</i>	Ova, Feb. 20-21	April 6-7-8
Feb. 28	var. <i>delamerensis</i> (slightly crippled)	<i>T. bistortata</i>	nil	
Mar. 7	<i>T. biundularia</i>	<i>T. bistortata</i>	Ova, March 16	April 21-22
" 7	do.	do.	nil	
(2nd pairing.)				
Mar. 9	var. <i>delamerensis</i>	<i>T. bistortata</i>	Ova, March 14	April 18-19
" 9	do.	do.	Ova, March 13-14	April 18-19
(2nd pairing.)				
Mar. 10	<i>T. biundularia</i>	<i>T. bistortata</i>	nil	
" 11	<i>T. bistortata</i>	var. <i>delamerensis</i>	Ova, March 15	April 26-27
" 12	var. <i>delamerensis</i> (slightly crippled)	<i>T. bistortata</i>	nil	
" 14	<i>T. biundularia</i>	<i>T. bistortata</i>	nil	
" 14	do.	do.	Ova, March 20	April 22-23
(2nd pairing.)				
Mar. 14	2 <i>T. biundularia</i>	2 <i>T. biundularia</i>	Ova, March 16-17	April 27-28
" 15	var. <i>delamerensis</i>	var. <i>delamerensis</i>	Ova, March 18	April 27-28
" 17	2 <i>T. bistortata</i>	2 <i>T. biundularia</i>	Ova, Mar. 20-21-22	Apl. 25-26-27
" 20	var. <i>delamerensis</i>	var. <i>delamerensis</i>	Ova, March 22	April 28-29

This table shows that the insects are reciprocally fertile. The number of ova laid in each batch was between 200 and 300.

I had an opportunity this year to compare the ova of each, side by side. Those of *T. bistortata* were larger, as I noticed in 1896; calculating roughly, the proportion of cubical contents would be about 4:3. As might be expected, the eggs by ♀ *T. bistortata*, fertilised by ♂ *T. biundularia*, produced ova of the size of those of *T. bistortata*, whilst those laid by ♀ *T. biundularia*, fertilised by ♂ *T. bistortata*, produced smaller ova (the size of those of *T. biundularia*). As regards shape, there seemed to me no constant difference, the irregularity of contour in so many of the ova of *all* the broods being evidently due to pressure, probably in extrusion through the long ovipositor, as I noticed some of the ova passed with their long axes making an angle of 45° or more with the axis of the passage, as well as externally, as the shell, though tenacious, appeared soft. In colour, I found a difference, the ova of *T. bistortata* being pale yellowish-green, whilst those of *T. biundularia* and var. *delamerensis*, and the crosses with either of these for ♀ parent, were much brighter green, with a decided bluish tinge. This difference was marked, so that the batches, when in mass, could be easily separated. I found, however, that this brighter bluish tinge was lost as the eggs developed, and after a time they all became pale yellowish-green, until they assumed the dark sea-green colour, which immediately precedes hatching.

As my experience in this respect seems somewhat different from that of Mr. Tutt, it is probable this variation in colour is not constant; at all events, the point requires further observation. The pupæ of *T. bistortata* (2nd brood), which I placed for three weeks in a refrigerator directly they pupated last autumn, yielded five imagines, the first on February 26th. Two were somewhat crippled, and none showed any difference from typical first brood *T. bistortata*.—April 30th, 1897.

VARIATION.

RED-COLOURED ABERRATIONS OF *SMERINTHUS TILIAE*.—I have lately come across a statement made by Mr. Barrett (*British Lepidoptera*),

that the reddish colour of *S. tiliæ* is generally due to changes produced after emergence. This is certainly incorrect as a general statement, as I have bred a good many since living in Devonshire, and the majority have a very considerable colouring of reddish terracotta, on emergence, and all have retained their green shades, as yet, without change. I have two, which are coloured entirely reddish and yellowish-brown (the latter colour between the second line and hind margin), and have not a trace of green. They emerged as such, and are ♂ and ♀. The male with this colouring is, I believe, rare. My specimens are from dug pupæ, a few forced in the spring, but the majority allowed to come out at their usual time, the end of May or beginning of June. There seems to be a considerable tendency to asymmetry, four of my specimens exhibiting this peculiarity.—W. R. RIDING, M.D., F.E.S., Buckerell, nr. Honiton, Devon.

It used to be supposed at one time that the red *S. tiliæ* were specimens that had fed entirely upon elm, but, not only do they come from larvæ fed upon other plants, but elm also produces specimens of an olive tint. For myself, I have dug at least ten pupæ from elm to one from lime.—SYDNEY WEBB, Dover.

The beautiful aberrations of *S. tiliæ* described by Mr. J. A. Clark, and figured in the *Entom. Record*, vol. i., No. 12, should have been sufficient to have guarded Mr. Barrett against making this general statement. The most beautiful red hues are to be found on many freshly emerged specimens of this common species. The red colour may be occasionally produced artificially, but most of those in our cabinets are bred specimens.—J. W. TUTT, F.E.S.

SCIENTIFIC NOTES AND OBSERVATIONS.

NOTE ON THE HOME OF *APHYTOCEROS VAGANS*, Tutt.—In the *Ent. Record*, vol. i., p. 203, are some notes on a Pyralid moth, described under the name of *Aphytoceros vagans*, which had been taken at Chepstow, and was in the possession of Mr. Mason, of Clevedon. I suggested at the time that it might be a native of South America or the West Indies. I am informed by Sir George F. Hampson that a specimen has more recently turned up from the Murchison Range, in the Transvaal. This is in the British Museum collection, and has been re-described, by Warren, as *longipalpis*, *A.M.N.H.* (6), ix., p. 391, and has been referred to Guenée's genus, *Leucinodes*, the moth standing in the British Museum collection as *Leucinodes vagans*. These two specimens are, at present, the only known individuals in existence.—J. W. TUTT.

NOTE ON THE SPECIFIC DISTINCTNESS OF *MICROPTERYX SALOPIELLA* AND *M. UNIMACULELLA*.—I have no hesitation in asserting that these are distinct and good species, although in the *Entomologist Synonymic List*, *M. salopiella* appears as a synonym for the ♀ of *M. unimaculella*. This is evidently an error. Stainton defines the two well in the *Manual*. The two insects are never out together, so far as I have observed, *M. salopiella* being generally a fortnight after *M. unimaculella* in the time of its appearance. I have also repeatedly taken both species *in cop.*, but they have always been paired true. The spots on the inner margin are quite distinct in shape in the two insects; in

M. salopivella it is triangular, and in *M. unimaculella* somewhat crescent-shaped. The head of the former is grey, that of the latter dark fuscous, and there are other well-marked characteristics.—A. H. HAMM, 24, Hatherly Road, Reading.

PRACTICAL HINTS.

Field Work for June and early July.

By J. W. TUTT, F.E.S.

1.—The larvæ of *Pachnobia hyperborea* are to be found under moss during early June, in firwoods where *Vaccinium myrtillus* grows (Staudinger), but the larva feeds on crowberry and bilberry, preferring the former (Meek).

2.—During June, the shoots of *Lysimachia* should be collected for larvæ of *Ctelechia morosa*. Wicken Fen is the best known locality.

3.—At the end of June, the stunted plants of sea-thrift growing on rocks on the sea-coast should be searched for pupæ of *Sesia philanthiformis*. The larva hollows out the main stem of the plant, and, for pupation, forms a silken tubular cocoon within the hollow.

4.—The flowers of *Silene maritima*, growing in a little recess, about 10 feet across, among the rocks on the shore near Douglas (I. of Man), of easy access, produced 105 *Dianthoecia caesia*, 32 *D. capsophila*, 4 *Plusia pulchra*, 12 *Eupithecia venosata*, and many other insects, during twenty evenings in June and July, 1876. The specimens were captured without moving from the spot, indeed, I was sitting on a stone most of the time (Birchall).

5.—When larvæ pupate in cork, be careful to isolate each one as it prepares to bore, otherwise two or more are almost sure to enter the same burrow, and only one (the last) will have any chance of escape.

6.—Webs of *Porthesia chrysorrhoea* should be searched for early on hawthorn. Mr. J. J. Walker informs us that he has this year observed them in the Isle of Sheppey, after the species has been practically absent from the district for nearly 20 years.

7.—About the beginning of July, before the healthy reeds overtop the affected ones, look over reed beds for reeds having the top shoot of the reed withered. About the end of July cut such reeds low down. A circular scar will be observed well down where the larva of *Nonagria geminipuncta* has gnawed through the reed-stem, except the outer skin, in readiness for the emergence of the imago.

8.—Place at the bottom of an old chip hat-box two inches of sand. Collect the seed capsules of *Silene inflata*, *S. campestris*, etc., and lay on the sand. Cover the top of the box with gauze by means of an elastic band. Put in a few fresh capsules occasionally, and you will breed *Dianthoecia conspersa*, *D. carpophaga* and *Eupithecia venosata* (Hall).

9.—Although *Leucania straminea* is best taken on the wing from 9 p.m. to 10 p.m. from about July 1st–August 1st, a drop of sugar in the centre of a flower of the dwarf thistle, common on the side of the dykes in the marshes, will frequently attract it.

10.—The larvæ of *Eupithecia subumbrata* (*scabiosata*) feed on the flowers of *Daucus carota* in July. The larva of *Spilodes palealis* feeds later in heads of the same plant.

11.—The examples of *Sciaphila conspersana*, taken on the salt-marsh at Southend, “appear to be very different from those captured in the neighbourhood of Dover; on the chalk cliffs, not only in colour, but in texture. They may ultimately prove to be a distinct species” (Howard Vaughan). This has never been reported upon.

FLOWER POTS AS BREEDING CAGES.—I use two garden pots for breeding purposes, a large one of 18 inches diameter, three parts or more filled with earth, and a small pot in which the food is planted, partly sunk in the earth of the larger one. Round the outside of the larger one sticks are placed, and round these, and attached to the rim of the pot a muslin side is formed. There are very few plants that do not trail over the edge of the pot when growing, and if the larvæ fall outside they have no trouble to find the food-plant again; whilst, when full-fed, the larvæ, as a rule, pupate in the outer pot. — S. WEBB.

NOTES ON COLLECTING, Etc.

NOTE ON *CALLIMORPHA DOMINULA*.—Having found, with the help of a friend, during the last year or two, one or two localities in which this species appears to occur pretty regularly, on some of the hills in this neighbourhood, it is interesting to note some of the characteristics it exhibits. In a hill-side wood, in which little that was noteworthy occurred, bordering one of the narrow tracks through it, the moths were found resting on the varied herbage usually occurring in such places. Only the hottest sunshine appeared to arouse them from their lethargy. They were frequently found *in cop.*, and, although the moth is beautifully and conspicuously coloured, as it rested amongst the variously-tinted herbage, it was not nearly so conspicuous as might be supposed. Not the slightest objection was offered to the boxing operation, and from the freedom with which eggs were laid, the student might be led to conclude that the chief purpose nature had in view in bringing the insect up to the development of wings was that flight might be evoked to facilitate the generation being continued. Amid the multiplicity of herbage, it was at first difficult to ascertain which were the food-plants the larvæ most preferred. Strawberry and lettuce were found equally acceptable with the time-honoured houndstongue. This latter, however, grows most commonly in the open, on waste hilly ground. The following year (that is the present), however, disclosed another and very different locality in which the larvæ appeared in extraordinary numbers. While this was not more than a quarter of a mile from the original locality, it was out in the open, though upon a gentle slope, and, reversing the general order of things, the insect appears to have been befriended by man in the introduction of a fresh and more relishing food-plant, if one may judge from the numbers seen banqueting upon it, or enjoying a siesta after having satisfied their hunger, when, in the genial sunshine of a gusty March day, they appeared to be “O’er all the ills of life victorious.” The plants upon which they were feeding or resting were sturdy tuberous-rooted specimens of the common comfrey, of which there were some hundred or two dotted about, being apparently the remains of a crop which had been sown for cattle fodder, and which, with a ruinous garden and building adjoining, had been for some time

deserted. *C. dominula*, however, though apparently enjoying the confrey, did not confine its feasting to that plant, but also severely lacinated the adjoining stinging-nettles. How many more plants are comprised in the *menu* of *C. dominula* further observation will, perhaps, some day record. There is, at least, one thing certain about its *habitat*, it will only settle down on a secluded hill, or a hillside wood, where a good blow of fresh air generally prevails, with a large assortment of different orders of plants.—J. MERRIN, F.E.S., 2, Oakleigh Villas, Barnwood Lane, Gloucester.

NEW FOOD-PLANT FOR TILIACEA AURAGO.—On March 28th, I found a few larvæ of *T. aurago* had emerged, and, as the beech-buds were not even expanded, and maple unavailable, I tried them on sycamore, on which they have since fed without further trouble.—W. E. BUTLER, Reading.

ENDROMIS VERSICOLOR BRED.—I have bred a few very fine *Endromis versicolor*, from eggs obtained from a female taken here by myself on April 6th last.—IBID.

AGROTIS CINEREA.—With regard to Mr. Nash's capture of *Agrotis cinerea* in this district (*Entom.*, p. 115), I may say that I recorded the species from this district (*Entom.*, xxvii., p. 71). I also captured three specimens last year.—IBID. [The note to which our correspondent refers is a strange mixture in which Gloucestershire and Reading insects are all recorded from Reading, due, Mr. Nash informs us, to a printer's error. With regard to the record of *A. cinerea*, Mr. Nash goes on: "*A. cinerea* is, I believe, considered a Cotswold insect." Now, one would ask, as the record is made in a scientific magazine, how this belief originated? That the insect occurs in the Cotswolds is well-known, but the species is *par excellence* a Lewes and Wye insect. The recent records for the species are Reading (*Entom.*, xxvii., p. 71); Winchester (*Ent. Rec.*, ii., p. 307; iii., pp. 133 and 162); Isle of Wight (*Ent. Rec.*, ii., p. 162); Chinnor Hill (*Ent. Rec.*, ii., p. 164); Swansea (*Ent. Rec.*, vi., p. 41); Brighton (*Ent. Rec.*, v., p. 305); etc.—ED.].

LOPHOPTERYX CARMELITA AT WEST WICKHAM.—At West Wickham, on April 19th, I took a very fine specimen of *L. carmelita*, on the trunk of a pine tree.—ALBERT SAMPSON, 71, Pownall Road, Dalston.

ACHERONTIA ATROPOS. May I, though somewhat tardily, add to the records of the capture of *Acherontia atropos*, last autumn, two specimens, *viz.*, a larva taken on August 7th, 1896, which pupated a few days afterwards, but was unfortunately "stung," and a pupa taken in the first week in October, 1896, which subsequently died? Both specimens were taken at Seaford, Sussex, by my friend, Dr. H. N. Evans, of that town, who kindly presented them to me.—H. AINSLIE HILL, F.Z.S., F.E.S., 9, Addison Mansions, Kensington, W.

EARLY APPEARANCES OF LEPIDOPTERA.—On April 22nd I had brought me a fine specimen of *Smerinthus tiliæ*, which had been taken from one of the electric arc lamps here, and during the last week I have obtained from the same source another *S. tiliæ*, four *Cerura vinula* (♂), two *Cucullia verbasci*, and one very fine *Drymonia chaonia* (♂). Are not all these remarkably early captures?—L. L. WINTERBOTHAM, Cheltenham. April 30th, 1897.

DASYCAMPA RUBIGINEA AND OTHER SPRING INSECTS AT READING.—During March I sugared regularly every week, in the hope of taking

Dasycampa rubiginea, but met with no success until March 20th and 21st, when I obtained two each evening, all females. I fed them carefully with thin syrup, but two died in a few days, and a third on April 30th, whilst one is still (May 4th) alive. They commenced to lay on March 22nd, and have continued to do so at intervals until the present time, so that I have now ova, larvæ and imagines at the same time. A few of the larvæ have already moulted twice. On March 20th and 21st the Tæniocampids were well represented. *T. pulverulenta* (very common), *T. gothica* (common), *T. incerta* (a few), *T. stabilis* (fairly common), *T. munda* (a few), *T. gracilis* (two), *T. miniosa* (a few), *Panolis piniperda* (one), and in addition, at willows, *T. populeti*, *Orrhodia vaccinii* and *Scopelosoma satellitia* were common both at sugar and willow. On March 20th and 21st, *Tephrosia bistortata* was well out, and continued to be taken sparingly up to April 24th; on the latter date I took my first *T. crepuscularia* (*biundularia*), in the same wood. *Nyssia hispidaria* continued to be taken sparingly until March 13th, when a friend and myself took eight males and one female. I have not seen it since. *Lobophora lobulata* was first taken on March 21st, and on April 16th I captured a male *Lophopteryx carmelita*, and on the 17th and 18th a few *Tephrosia punctulata*, *L. lobulata*, *Xylocampa areola*, *Filonia atomaria*, *Pachynemima hippocastanaria*, *Eupithecia punctulata* and *T. bistortata* (3). These latter are the first taken in an entirely new locality. On April 19th, *Boarmia cinctaria* and *Eupithecia abbreviata* were obtained; and on April 24th, *Tephrosia punctulata*, *L. lobulata* and *Lophopteryx carmelita* (male) were captured, besides the *T. bistortata* and *T. crepuscularia* previously mentioned. On May 1st, *T. crepuscularia* (*biundularia*) and *Cucullia umbratica* were captured, whilst *T. punctulata* was very abundant.—A. H. HAMM, 24, Hatherly Road, Reading.

CURRENT NOTES.

Mr. Champion (*E.M.M.*) shows that *A. succicola*, Thoms. (? = *A. sparsa*, Heer), not hitherto recorded from Britain, and *A. moesta*, Grav., are confused in British collections under the latter name. Most of the specimens in British collections are *A. succicola*. *Platystethus alutaceus*, Thoms., is also recorded as a British insect from ? Morden, Surrey, and Slapton Ley, Devon (captured April, 1897).

Mr. Eustace R. Bankes (*E.M.M.*) gives a very interesting *resumé* of the distribution of *Gelechia suppeliella*, Wlsm., in Britain and Germany. The larvæ from which Warren bred *G. suppeliella* (*E.M.M.*, xxv., p. 161), were taken near West Wickham, and the Rev. G. H. Raynor captured the species at Sandy, in Beds, in 1883. He further points out that the true *G. peliella* probably does not occur in Britain. He considers that Stainton's descriptions in *J. B. Lep. Tin.*, p. 111 (1854) and *Nat. Hist. Tin.*, ix., 106-15 (1865), must have been made from *suppeliella*, and not from *peliella*. Lord Walsingham adds that the distribution appears to be as follows:—" *G. peliella*, ? Lapland, Livonia, Oesel, Germany, Holland and Corsica. *G. suppeliella*, Germany, Holland, England."

Mr. Lucas records (*Entom.*) and describes (with figure) *Anisolabis annulipes*, Lucas, from Kew Gardens, the specimens having come to

England from Ootacamund, in the Presidency of Madras. The first British specimen came from Tavistock, in Devon, in 1894.

A superficial and illogical paper on "Melanism and Climatic Conditions" appears in the *Entom.* for May. The author writes from the College, Winchester, and the paper might readily be supposed to emanate from a school boy who did not understand his subject. But why such a prominent place in *The Entomologist*?

Dr. Dixey read another very interesting paper on mimicry, at the meeting of the Ent. Society of London, on May 4th, and Mr. Blandford, to illustrate his remarks on "Homoeochromatic groups of butterflies," exhibited a part of the unparalleled Godman and Salvin collection, including many of Bates' original types and figured specimens. Why was not Dr. Dixey's paper properly advertised as to be read on that evening, we wonder? Many entomologists will attend to hear Dr. Dixey and Prof. Poulton who come at no other time.

A very successful conversazione was held at the London Institution on the evening of April 27th, by the City of London Entom. Society. In the course of the evening Lord Walsingham delivered a short, but highly interesting, address to the members and their friends, dwelling particularly upon the value of scientific societies. Mr. Enock gave one of his excellent illustrated lantern lectures, "The trap-door spider," and Dr. Gerard Smith discoursed on X-rays, and illustrated his remarks by a series of very interesting experiments.

The insects sent by Dr. Standfuss for exhibition at the Conversazione of the Royal Society have been placed in the Insect Gallery of the British Museum, South Kensington, so that all entomologists may examine them. They consist of: (1) Remarkable mongrels and hybrids. (2) Aberrations resulting from series of temperature experiments. Some of the more remarkable aberrations produced by Mr. Merrifield are also placed on exhibition with them.

SOCIETIES.

THE CITY OF LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.—April 6th, 1897.—*CIDARIA IMMANATA* FROM RAINDENE WOOD.—Dr. Sequeira: a series of *Cidaria immanata* from Raindene Wood, near Folkestone. *XYLEBORUS SAXESENII* FROM RICHMOND PARK.—Mr. Heasler: a series of *Xyleborus saxeseni* from an oak stump in Richmond Park last November. He said: "This species belongs to the group which bore into the solid wood, and are usually difficult to obtain, especially when they take to oak. The whole of my specimens, however, were taken in the bark in company with *Dryocoetes villosus*, *Placusa pumilio*, *Rhizophagus ferrugineus*, etc." *TÆNIOCAMPA POPULETI*.—Mr. Taylor: a series of *Taenioampa populeti* from Wimbledon, illustrating the entire range of variation of the species in this district, and including specimens of ab. *obsoleta*, Tutt, and ab. *intermedia*, Tutt. THE LEPIDOPTERA OF THE ISLE OF DOGS.—Mr. Woolley read some "Notes from the Isle of Dogs." He gave a list of the Lepidoptera to be taken on the island, and exhibited many of the species and some plants. The particular piece of ground from which all these were taken was about a mile square, and was constantly used by the Millwall Dock Company as a receptacle for the mud which is dredged from the bottom of the dock. The land was divided into three parts, and each division was

flooded with mud every third year. The following is a list of the Lepidoptera taken on the island. RHOPALOCERA:—*Pieris brassicae* (common), *P. rapae* (common), *P. napi* (common), *Aglais urticae* (common), *Pyrameis atalanta* (fairly common), *P. cardui* (not common), *Chrysophanus phlaeas* (not common). SPHINGIDES:—*Smerinthus ocellatus* (not common—3 imagines, 4 larvæ), *S. populi* (not common). CHELONIIDES:—*Spilosoma lubricipeda* (common), *S. menthastri* (common), *S. urticae* (single specimen), *Arctia caja* (common as a larva), *Deiopeia pulchella* (single specimen), *Liparis salicis* (single specimen), *Orygia antiqua* (common). NOTODONTIDES:—*Dicranura vinula* (single specimen). GEOMETRIDES:—*Rumia crataegata* (common), *Abraxas grossulariata* (not common), *Hemerophila abruptaria* (not common), *Camptogramma bilineata* (single specimen), *Boarmia repandata* (not common), *B. gemmaria* (fairly common), *Melanippe sociata* (common), *M. fluctuata* (common), *Cidaria corylata* (not common), *Eupithecia centaureata* (not common), *E. subnotata* (common), *Pelurga comitata* (common). NOCTUIDES:—*Acronycta megalcephala* (larvæ only, and not common), *Leucania conigera* (fairly common), *L. pallens* (common), *L. impura* (common), *L. comma* (not common), *Hydroecia micacea* (not common), *Xylophasia lithoxylea* (common), *X. polyodon* (very common), *Gortyna flarago* (took 15 in 1892—never before or since), *Manestra brassicae* (very common), *Luperina testacea* (fairly common), *Apamea basilinea* (not common), *A. didyma* (common), *Caradrina cubicularis* (not common), *Peridroma suffusa* (common), *Agrotis exclamationis* (very common), *A. nigricans* (very common), *Tryphaena pronuba* (common), *T. jimbria* (single specimen), *Noctua xanthographa* (common), *Cosmia trapezina* (not common), *Phlogophora meticulosa* (not common), *Plusia gamma* (very common), *Hadena trifolii* (very common), *H. oleracea* (very common), *Hecatera serena* (single specimen). HEPIALIDES:—*Hepialus humuli* (common), *H. lupulinus* (common), *H. sylvinus* (not common). Mr. Tutt wondered what *Cidaria corylata* fed upon in the Isle of Dogs, but said that *Camptogramma bilineata* generally occurs wherever there is any garden herbage. ARCTIA CAJA AB. FLAVESCENS.—Mr. Clark exhibited bred specimens of *Arctia caja* ab. *flavescens*, from larvæ taken near Hackney Marsh. ASTYNOMUS AEDILIS AT LEA BRIDGE.—Mr. Clark also exhibited two specimens of *Astynomus aedilis*, taken at Lea Bridge. BISTON HIRTARIA IN MARCH.—Dr. Sequeira reported *B. hirtaria* as abundant in North London. He had taken seven specimens in less than half-an-hour on the 21st March.

April 20th, 1897.—SPRING MOTHS.—Mr. Dadd exhibited representatives of the genus *Taeniocampa*, which had been captured at Oxshott at the end of March and on April 1st. The exhibits included a very fine series of *Taeniocampa miniosa*. CIDARIA PSITTACATA.—Dr. Sequeira exhibited some very fine specimens of *C. psittacata*, including many banded individuals from the New Forest. LARVA-BEATING.—Mr. Dadd reported that he had beaten for larvæ at Oxshott, on April 19th. The pines gave four species, including *Thera variata* and *Ellopiia fasciaria*. He had also found imagines of *Tephrosia bistortata*, on fences, and beaten imagines of *Panolis piniperda* from a pine-tree.

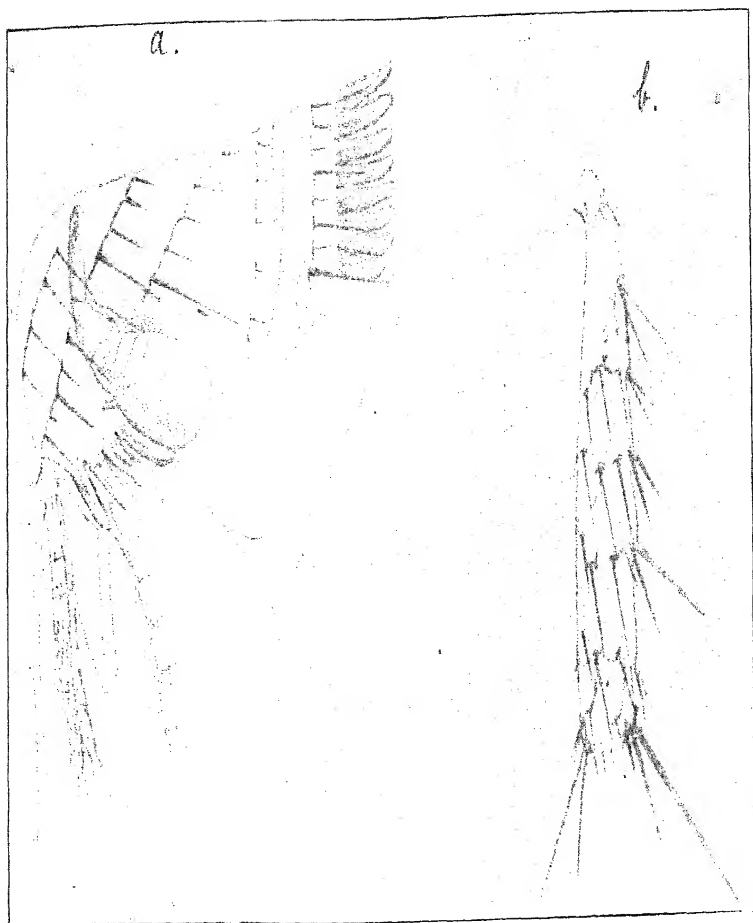
CAMBRIDGE ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.—ABDOMINAL CHAMBERS IN CHRYSIRIDIA MADAGASCERENSIS.—At the meeting held on April 30th, Dr. Sharp called attention to a peculiar structure which he detected some years ago in *Chrysidia madagascerensis*,

better known as *Urania rhipheus*. On each side of the 2nd abdominal segment there is an ear-like opening, usually much concealed by overlapping scales, giving entrance to a chamber, which extends to the middle line, and forwards, towards the base of the abdomen, so that a considerable space in the anterior and upper part of the abdomen is occupied by the chambers. At the anterior external part of this depression or chamber there is a second vesicle-like chamber, formed by a delicate membrane. He considered this structure to be some kind of sense organ, and thought it must be of great importance to the creature, as it occupies a large area of the abdominal region. It is independent of sex, and apparently occurs in all the members of the families *Uraniidae* and *Epiplemidæ*. Mr. Oberthür had kindly supplied him liberally with dried specimens, for the examination of this organ; but fresh individuals, or some well preserved in spirit, are necessary before any of the finer details of the structure can be ascertained.

REVIEWS AND NOTICES OF BOOKS.

DAS STUDIUM DER BRACONIDEN, ETC. von Dr. O. Schmeideknecht. [Pubd. by J. Neumann, Neudamm, Germany. Price 1s.]—The idea of this brochure is a good one, but the mode of its execution leaves something to be desired. It would appear that the Rev. T. A. Marshall has in vain tried to use it in concluding his 3rd volume of the *Braconidae*. The dichotomy of the table is so imperfect, that the enquirer is sure to lose himself at every fresh search. New headings occur in the middle of the work without any numbers leading up to them: *ex. gr.*, at the beginning of *Bracon*, No. 7 has no connection with any previous no. One is tempted to surmise that the author has only a hazy notion of dichotomy, as the definitions are not always contradictory, as they should be. This is not important in the case of old and well-known species, but the 22 new species are absolutely indeterminable. Of course, they require detailed descriptions, and anything short of this is merely illusory. The manner in which the divisions are printed gives no assistance to the eye. In fact, the confusion already subsisting in the genus *Bracon* will not be mitigated by anything in this paper, and the list of doubts is increased by 22. It is to be regretted that the writer is a blind partisan of C. G. Thomson, and adopts without enquiry all his conclusions, some of which are certainly wrong. The chief mistake which falls within the scope of this present work is the insertion in the genus *Vipio* of some species belonging to the *Doryctidae* (p. 6, Nos. 26-29); this is from Thomson. And again, No. 31 is not *Vipio*, but *Bracon* (*Iphianlar*, Förster). This last fad of Thomson's leads to a confusion quite chaotic, if adopted, and destroys all distinctions between *Vipio* and *Bracon*. Many hundreds of exotic species of *Bracon* (*Iphianlar*) are now to be joined to *Vipio*, though totally unlike, merely on the authority of Thomson. Lastly, Dr. S. has not quite included all the described species of the two genera.

NOTICE.—Owing to the summer holidays, the July and August numbers will be published on July 1st and August 1st respectively. Exchange Lists, Advertisements, etc., for these numbers must be sent in accordingly.



A NEW BRITISH FLEA (*Tryphlopsylla dasycnemus*, sp. nov.).

a. HEAD AND PROTHORAX.

b. POSTERIOR TIBIA.

The Entomologist's Record AND JOURNAL OF VARIATION.

VOL. IX. No. 7.

JULY 1st, 1897.

A New British Flea (*Tryphlopsylla dasyncnemus*, sp. nov.).

(Illustrated by Plate).

By the Hon. N. C. ROTHSCHILD, F.Z.S., F.E.S.

Tryphlopsylla dasyncnemus, sp. nov.—Description—Front of the head rounded, and more or less hairy, with *four* genal spines, situated as in *T. assimilis* of British authors, and a small *fifth* spine at the anterior edge of the antennal groove. The pro-thorax has *sixteen* spines. On each side of the dorsal posterior edges of the first *six* segments of the abdomen there is a *single* short spine. The ventral plates of the *eighth* segment display *four* hairs, of which the upper one is much the longest. The *outer* surface of the tibiæ, more especially of the hind ones, is extremely hairy.

Parasitic on *Sorex vulgaris*.

The present species was discovered this year by Dr. Jordan, on the above-mentioned animal. I am much indebted to him for specimens and the beautiful drawings of the head, pro-thorax and tibia.

The development of the wing, wing-scales and their pigments in Butterflies and Moths.

By J. W. TUTT, F.E.S.

II.—THE DEVELOPMENT OF THE PIGMENT WITHIN THE SCALES. — In the previous part of this paper, we have seen that when the scale first appears it is only a small protoplasmic cell, which very soon increases in size, and flattens out, and finally assumes the outward shape of the mature scale. A layer of chitin is then secreted over its entire outer surface, so that the scale becomes a thin, flat chitinous bag, filled with protoplasm, the chitin upon the upper surface of the scale being striated, the lower surface smooth. Many scales have two sets of striæ—a well-developed longitudinal set, and a finer transverse set. These striations diffract the light, and give rise to the iridescent colours observed on the wings of many lepidoptera.

So long as the scales remain filled with protoplasm, they are quite transparent, but the protoplasm afterwards becomes coarsely granular, and appears to give place to a secretion from the hæmolymp, which contains the necessary material for the elaboration of the pigment, the white coloration being different from the opaque whiteness noticeable in air-filled scales. Mayer says that "the scales which are

destined to be white upon the mature wing are now completely formed, and undergo no further changes, hence, ontogenetically speaking, the white spots (? scales, J. W. T.) upon the wing are the oldest of all." Here we would offer two notes of criticism : (1) That the white scales of an insect's wing are of two entirely different classes. Some white scales are quite richly pigmented (see *Entom. Rec.*, vol. vi., p. 35 *et seq.*, 109 *et seq.*, 204 *et seq.*). The white areas of the wings of *Arge galathea*, the white spots on the wings of *Syrichthus malvae*, and numerous other examples, have been already fully discussed.* (2) That the whole of the scales (pigmented and unpigmented) are supplied with air, only in the final stage of their development.

The secretion from the hæmolymph (= the "pigment factor" of Ridg), which fills the scales destined to become pigmented, now enters them. It does not enter scales which will finally be white (due to air contents), but does, in many insects, enter other scales, which are ultimately white. Mayer says the hæmolymph of the chrysalis, which is a clear amber yellow fluid, now enters them, but Chapman has already adversely (*ante*, pp. 78-79) criticised this view, and has suggested that only a secretion of the hæmolymph does so. The material in the scales now becomes "ochre-yellow" in tint, whatever their ultimate colour is destined to be, and, having remained in this stage for about 24 hours (in the case of *A. archippus*), the mature colours begin to show themselves. "These mature colours always appear first within scales which are situated between the nervures. They are faint at the beginning, but gradually increase in intensity. For example, if a scale be destined to become black, it first becomes pale greyish-brown, and this colour gradually deepens into black.† This pigment is no doubt derived from the hæmolymph within the scale at the time when it first appears. It is probably produced by chemical processes that are somewhat analogous to the clotting of the blood, for the pigment is found to be sublimed over all the surfaces of the cavity of the scale, the layer of pigment being especially thick upon the upper surface of the scale."

III.—THE PROBABLE CHEMICAL AND PHYSICAL NATURE OF THE PIGMENTS OF LEPIDOPTERA.—Landois, in 1864, found that when the blood of beetles and butterflies was allowed to evaporate in the air, crystals separated out. He also found that the blood consisted chiefly of egg-albumen, but that globulin, fibrin and iron were present. He further observed, that when the blood was allowed to dry in the air, it generally became brownish or yellowish, and that while the colours of the blood were different for different species, the colour assumed by the dried blood was apt to be similar to the ground-colour of the wings of the mature insect from which the blood was drawn.

Mayer states that he believes the pigments of the scales are derived from the hæmolymph, or blood, of the chrysalis; and his chief reason for believing this is, that he can find no evidence that there is anything but hæmolymph within the scales during the time that the pigment is formed. Chapman doubts whether the crude hæmolymph ever enters them, but thinks that a secretion from it does so, and that the

* "The genetic sequence of insect colours."—*British Noctuae and their Varieties*, vol. ii., pp. i.—xviii.

† This fully bears out our contention as to "pigmentary blacks."—*Brit. Noct.*, ii., pp. vi.—vii.; *Ent. Record*, vi., pp. 38-40 and pp. 104-111.

latter contains the materials necessary for going through the chemical change resulting in pigmentation.

Mayer has made a chemical analysis of the pupal blood, which agrees with that made by Landois. When the hæmolymph is agitated with ether, the proteid substances are coagulated, and a clear amber-yellow solution is left. When thus isolated the proteids are slightly yellowish, but they soon dry into a drab-coloured mass, very much as the hæmolymph does upon exposure to the air. Spectrum analysis shows that the colour of the amber-yellow solution is due to xanthophyll, and Poulton found that the colours of many lepidopterous larvæ and pupæ were due to chlorophyll and xanthophyll, derived from their food. The hæmolymph is acid to litmus, and contains a large amount of orthophosphoric acid. The mineral bases of the hæmolymph are iron, potassium and sodium—the iron in considerable quantity. “The freshly-obtained hæmolymph is a clear opalescent amber-yellow fluid; it soon becomes turbid upon exposure to the air, and in less than half-an-hour after removal from the chrysalis becomes opaque, and drab or greenish-drab in colour.” Mayer further notes that the drab colour, assumed by the dried hæmolymph from the pupa of *Callosamia promethea*, and the greenish-drab assumed by the dried hæmolymph of *Philosamia cynthia*, are very similar to the principal colour of the moths’ wings. The change in colour exhibited by the hæmolymph upon exposure to the air is probably not due to a simple process of oxidation. It takes place slowly in an atmosphere of hydrogen; an atmosphere of CO_2 prevents it; whilst, if the hæmolymph be sealed up in air-tight glass tubes, it retains its amber colour indefinitely. Heated to 54°C , it begins to congeal, and above 63°C solidifies into a chrome-yellow mass, and in this condition it will keep indefinitely, and retain its original chrome-yellow colour; but when congelation is produced in hæmolymph that has become drab by exposure to air, the congealed mass is also drab in colour.

To test whether the colours of the mature wing are derived by various chemical processes from the hæmolymph of the pupa, Mayer performed the following experiments: (1) He treated the hæmolymph of *Samia cecropia* with warm concentrated HNO_3 , when it congealed into a deep chrome-yellow mass. Ammonia (in excess), added to this, changed it to reddish-orange, very similar in colour to the reddish-orange band that crosses the upper surface of the hind-wings of the moth. The reddish-orange band of the moth is changed to chrome-yellow by HCl or HNO_3 , and, on ammonia being added, the original red colour returns. Exactly the same sequence of reactions is produced with the pigment derived from the hæmolymph. (2) Treating the drab-coloured outer edge of the wing of *S. cecropia* with warm HNO_3 , and evaporating the acid off at a gentle heat, the drab pigment of the scales was found to be changed to a deep chrome-yellow. The addition of ammonia makes it reddish. Similar reactions are obtained from the hæmolymph, after it has congealed in the air, into a greenish-drab mass. (3) The drab hæmolymph of *Callosamia promethea* is dissolved and changed to a sepia-brown colour by warm HCl , to which a crystal of KClO_3 is added. An exactly similar change occurs when the drab-coloured edges of the moths’ wings are treated in a similar manner.

These experiments, like those of Coste (*Entomologist*, 1891, *et seq.*)

and Urech (*Zeit. f. wiss. Zool.*, lvii., 1893-1894), get no further, in fact, not so far, in relation to the white pigmentary scales as Coverdale and myself got some twelve years ago (*Brit. Noct.*, vol. ii., pp. iii.—xviii.). A brief statement of the general action of alkalis in changing pigments, and of acids in restoring the changed pigments to their original colours, was published by Coverdale (*Entom.*) in 1886.

(*To be continued*).

Paper as a Pabulum for the Larva of *Tiresias serra*, F.: with some notes on the Larva and its Pupation.

By HORACE DONISTHORPE, F.Z.S., F.E.S.

I have just succeeded in rearing a number of *Tiresias serra* from the larvæ, by feeding them on paper.

The larvæ, which were of all sizes, were obtained under loose bark of hawthorn trees, last March, in Richmond Park, where they are very abundant. I placed them in a collecting bottle which contained some paper, and left them there for a day or two, during which time I was making inquiries as to what to give them to eat. I was told to give them flies to feed on, which I intended to do, when I discovered they had eaten holes all over the paper which was in the bottle, and so I thought I would try if I could rear them on such food. The experiment turned out quite successful, and they commenced to pupate in about three weeks, and the perfect insects began to appear in a little over a fortnight.

The larva is a very curious animal—it is hairy, like those of all the *Dermestidae*, and has bunches of hair on the last segments of the hind body, with a long tail of hairs at the apex; these bunches the creature can erect at will, and, when agitated, the tail hairs vibrate very rapidly. It pupates within the larval skin, and, on changing to the imago, it remains within the skin till mature. It is a curious fact that, though the larvæ occur in great numbers, and are very common, the perfect insect is decidedly scarce, and is generally found singly.

An attempt to breed *Leucania albipuncta*.

By LOUIS B. PROUT, F.E.S.

On August 31st last, I captured a worn female of the above-named species, at sugar, at Sandown. I placed her in a glass jar, with a sod of grass at the bottom; and about the 4th or 5th of September some ova were deposited, to the number of 32, or thereabouts. These were laid in four fairly regular rows, from six to twelve in each, three of them on the sides of the glass (very likely, however, under blades of grass, which were torn away in removing the sod), the others between the points of two fine blades of grass, which were glued together by them. This would, probably, be the natural egg-laying habit of the species. The eggs were of about average size, roundish, smooth, and of a shiny, whitish straw-colour, and I noticed nothing particular to remark in them with the unaided eye. In about eight or nine days they changed to a light, shining grey, and on September 15th and 16th, the larvæ hatched (to the number of 28). These were of a tolerably uniform pale grey, greener in some individuals (? after commencing

to feed), and with the back of the thoracic segments darker; the head, orange-brown, appearing somewhat horny. All the prolegs were developed, but only the posterior pairs were used for clasping, hence the usual looper gait was assumed. They rested in a slightly arched posture, the head being brought down to the resting surface, but the legs apparently drawn together, not used for clasping. They were rather restless at first, and when they were touched, or the grass upon which they were resting was moved or jarred, would frequently drop by a fine thread.

I am, unfortunately, entirely ignorant of the names of the different species of our common grasses; but I think I may state positively that the larvæ were not particularly discriminating, for they fed freely on any that were offered them.

On September 18th, I made the following notes as to their habits, etc.:—"Twenty-five are thriving, the other three missing. Feed very freely on the broad, or moderately broad, but tender blades. Never attack the edges, but chiefly make elongated holes (right through the blade) between two of the ribs, and generally near the edge. To-day, at 9 a.m., I am watching some of them feeding on the fresh food (they are not at all shy of the light); they rest on the edge of the blade, and reach the fore-part of the body round to the 'point of attack,' at the underside of the blade. They are still decidedly restless, and after being alarmed into dropping, begin to crawl immediately. Since feeding, they are much greener in colour, the fore part of the body slightly the stouter, and somewhat dark. The first abdominal segment apparently paler."

The following day I presented 16 of the larvæ to my friend, Mr. J. A. Clark, whose usual success in breeding led me to hope he would get them through; eight I retained myself for further observation. Unfortunately, some of Mr. Clark's larvæ must have escaped from the box in which I took them to him, for when he came to put them out next day he found only 11, and these gradually dwindled down from various causes, until the last one succumbed at its final moult. I am afraid I am in part responsible for Mr. Clark's want of success, as I told him that the larvæ would have to hibernate, and he misunderstood me to mean that I did not advise forcing them up indoors, and he had lost most of them before he learned from me that I was forcing my own, and that they were doing much better. However, he attributes the failure largely to his recent pressure of business, ill-health, and absence from home. He has kindly placed in my hands the notes he made, for incorporation with my own in this paper.

I noticed about this time that the larvæ showed a much greater propensity for concealment than was observed the first day or two, generally retiring to hide in the centre of a folded grass blade, or up at the junction of the leaf-portion with its stem.

The first moult was reached on September 21st. In the second skin the colour was still mainly grey-greenish, as before, but less shining and more opaque. Head transparent pale-brown, with faint indications of two curved blackish lines down the face. Dorsal line whitish, slender, bounded by very faint black lines; sub-dorsal pale, bounded with black above; then a double dark line, very fine, then a black line just above the spiracles, also double. All these lines appeared to be continuous. The ventral area and the claspers, paler brown. The "looping" propensity of the larva not abandoned.

In this skin, the growth began to be somewhat irregular, and three of my "forwards" were in their third skin by October 3rd. No important change was noticed in this skin. As their appetites seemed to be falling off, and I suspected they intended laying up for hibernation, I brought them into a warm room, where they all continued feeding, though one or two got far in advance of the others. On account of the irregularity of growth, I found considerable difficulty in keeping exact count of the moults; but it is tolerably certain that the most forward specimen—the only one which I got into pupa—moulted six times, and probably even seven; namely, about the following dates:—Sept. 21st, Oct. 1st, Oct. 24th?, Oct. 31st, Nov. 6th, Dec. 4th, Dec. 14th. The third skin would probably be the hibernating stage; but, if so, it is curious that there should be so many changes subsequently. From Mr. Clark's notes it would appear that his larvæ only moulted twice after he began forcing them (when they were certainly still quite small), and one of the most careful German observers of the last century (Brahm, in *Scriba's Beiträge*, 1791), also says that those larvæ which he found in winter underwent two ecdyses before pupating.

The changes in the different skins were not very marked. After the first two or three stages the greenish tone of colour was replaced by a pale wainscot-brown; at about the same period the looping gait was abandoned. I made a fresh description on November 6th, just before the 5th (?) moult, but it tallies pretty closely with the earlier one. The portions which are to be described as being of the ground-colour were really composed of very fine and close longitudinal striæ. The length was now about half an inch, or slightly over. The larva now rested in a straight posture, with legs and claspers attached; but when disturbed would draw itself into a slightly arched position, with the legs and front pair of claspers resting slightly on the grass or other surface, but apparently unattached.

After this change, the dark grey-blackish lines were more pronounced, and the single black line (sub-dorsal) was now first accompanied by a row of minute deep black dots, one to each segment, except the last two or three. In this skin (the 6th?) there was another temporary cessation of appetite and growth, and this may, perhaps, be the normal hibernating stage, which would leave for the spring the two changes which have been specified by Brahm. But it is mentioned that the species is of somewhat irregular habit, found of various sizes at the same time, and I confess I am very sceptical about rigidly fixed hibernating stages (as advocated by Mr. Tutt) for many species. This last winter I have been breeding *Melanippe montanata*, and found that the var. *shetlandica* hibernated in the last skin but one. Some of a London batch laid up for hibernation in the same skin, but died during the winter, while the only two of that batch which came through successfully were in their last skin, and only fed seven and ten days respectively in the spring, before pupating.

In the last stage but one (7th?) my forward *albipuncta* showed a further advance in the direction of the darkening of the sub-dorsal; the black spots upon it becoming too large to be designated "dots," and there being two apparent on each segment. All the moults with this species appear to be rather laborious; most of them (including even the first) occupied about two days; while the final change

occupied about five days (Dec. 14th-19th), and it was at this change that my last larva but one succumbed, and also Mr. Clark's last. Growth in the last skin but one (Dec. 6th-14th) was so rapid that I thought the larva was going to make this the final stage. I do not appear to have measured it on December 14th, but I fancied it would be large enough to produce a moth about the size of *Taenioecampa pulverulenta*, and supposed that through some mismanagement I was going to breed a dwarf. However, as already mentioned, it moulted again, and fed up in its final skin till January 5th, 1897, when it went to earth, having attained a considerable size, proportionally to the pupa which it produced. This pupa was, roughly speaking, about the size, shape and colour of an ordinary *Hoporina croceago*. Of course, this is only a rough superficial comparison, and I do not for a moment wish to suggest any structural relationship; I know practically nothing of the normal Leucanid pupa.

In its last skin the larva was a more striking creature in appearance, through the greater intensification of the markings; but it was nothing like the gay figure which Owen Wilson gives in his "Larvæ of British Lepidoptera." Old Brahm's figure, executed nearly 100 years earlier, is far better in shape, colour, etc., albeit rather rough; however, Brahm says he has found the larvæ very variable, and we must suppose that Owen Wilson's figure (which we learn from his introduction was from Nature) represented a very brightly-coloured specimen; yet he might surely have done better justice to the tapering form. His *description* seems accurate; that by Brahm is really first-rate, and if his work were in the hands of the present generation of entomologists, I would not waste space in re-describing the full-grown larva. However, as probably none of my readers have seen his description, I append the following notes, which I made on December 26th:—"Now measures $1\frac{1}{8}$ inch when drawn up at rest, just upon $1\frac{1}{4}$ inch when stretched in crawling. Tolerably stout in proportion, tapering slightly to anal extremity. Head, somewhat shiny horn-colour, with two indistinct grey lines down the face; scutellum intermediate in colour between the head and the dorsum generally, slightly shiny; traversed by three yellowish-white stripes, being the commencement (differently coloured) of the dorsal line and the sub-dorsal. Body, a sort of wainscot-brown, more inclining to dirty flesh-coloured laterally and ventrally, leaving the dorsal area clearer yellowish-wainscot colour. The line or band below the spiracles is also fairly well defined, being paler than the two areas which it separates; it is decidedly waved, rising to the segment-incisions, and falling below the deep black (but small) spiracular dots; the skin on this lateral line is somewhat loose-looking and rugose, especially on the final three segments. The dorsal area is really of two shades, clean yellowish against the sub-dorsal line, more fleshy against the dorsal. The dorsal line (as remarked in earlier skins) is double, blackish (very fine), enclosing a fine whitish line; the two blackish lines approximate very slightly in the centre of each segment, diverging a little at the boundaries. The lateral area, above the spiracles, is likewise not really uniform in colour, but the lower half is more fleshy, the upper half more yellowish; the two bands faintly separated by an indistinct grey line. The sub-dorsal line is slender, white, bounded laterally by a *very* slender, brownish line,

dorsally by a very conspicuous black-brown line, interrupted at the segment-incisions, and paling off from black-brown to umber posteriorly on each segment; the effect is as though the whole line were umber, and overlaid with deep black on the anterior two-thirds of each abdominal segment, the black giving place to a slight sprinkling only, as one proceeds posteriorly. It should be mentioned that the thoracic segments are slightly dirtier-looking (more tinged with greyish) than the abdominal, and that on the former the umber line is not overlaid with black, except a very slight and inconspicuous freckling, and one deep black dot on each segment. Tubercles very minute and inconspicuous, except the trapezoidals, of which the anterior are further apart, and, I think, *very slightly* larger than the posterior; bristles very short and inconspicuous, I believe, single; but I made no note on the point."

The larva is rather shy, and seems to feed only at night (except in its very earliest stages). Brahm used to find the larvæ by day concealed on the ground, under leaves of low plants, chiefly mullein, burdock, teasle, etc., and found they would also eat chickweed. I occasionally offered my larvæ the last-named plant, but did not observe them touch it.

The pupa was kept close to a fire, and the final darkening took place on February 21st, after a pupal period of over six weeks. The white spot of the wings showed very prominently through the cases. I suppose I did not keep it sufficiently damp to counteract the influence of the heat, for, to my great mortification, it died, instead of emerging; and the satisfaction of having bred a specimen of this rarity was denied me, though I have had the interest of watching it through its complete life cycle.

Notes on the *Zygænidæ*.

- III.—*Z. LONICERÆ* A CONSTANT SPECIES IN BRITAIN, AUSTRIA AND FRANCE.—*ZYGÆNA MEDICAGINIS* EARLIER IN ITS APPEARANCE THAN *Z. LONICERÆ*.—FERTILE HYBRIDS.—CRITICISM OF BARRETT'S REMARKS ON THE SPECIFIC IDENTITY OF *Z. LONICERÆ* AND *Z. TRIFOLII*.—*Z. MEDICAGINIS*, Bdv. (DUBIA, STDGR.) AS A DISTINCT SPECIES.—*Z. MEDICAGINIS* MORE CLOSELY ALLIED TO *Z. LONICERÆ* THAN TO *Z. TRIFOLII*.—CRITICISM OF LEDERER'S AND SOUTH'S REMARKS ON THE RELATIONSHIP OF *Z. MEDICAGINIS* WITH *Z. FILIPENDULÆ*.—*Z. HIPPOCREPIDIS*, St. NOT CO-SPECIFIC WITH *Z. MEDICAGINIS*.—UNION OF *Z. MEDICAGINIS* AND *Z. OCHSENHEIMERI* BY CONTINENTAL AND BRITISH ENTOMOLOGISTS.—REMARKS ON SO-CALLED SIX-SPOTTED *Z. MEDICAGINIS*.—BAKER (-BETHUNE)'S CAPTURES IN THE BUTTIER VALLEY.

(Continued from p. 107).

By J. W. TUTT, F.E.S.

Zygæna loniceræ is probably the most constant of all the British species of that particular group of the genus to which it belongs. Occasionally, a blotched specimen occurs (Nix, *Entom.*, x., p. 180, Hewett, two bred specimens, *Entom.*, xxv., p. 251, Bower, *Ent. Rec.*, vi., p. 19), but the form is rare, and it would appear to be equally rare on the Continent, for Oberthür writes: "*La Zygæna loniceræ* aberre très rarement par la confluence des taches. Nous n'avons

encore capturé qu'un seul spécimen de cette variété; tandis que dans la *trifolii* des plaines du centre de la France (laquelle *trifolii* de nos pays diffère un peu de celle du Midi) la confluence est très commune" (*Études d'Entomologie*, "Lép. des Pyrénées," p. 31). I have a note to the effect that this form = Hübner's *achilleae*, *Eur. Schmett.*, fig. 165. As for the type form, it can usually be recognised without difficulty. I have taken typical specimens of this species quite indistinguishable from those obtained at Strood, York, Mansfield and other British localities, at Courmayeur (Piedmont, 3,500 ft.) August, 1894, on the summit of the Mendel Pass (Tyrol, 4,000 ft.), where it was just emerging, from July 28th to August 3rd, 1895, on the zigzags between St. Michel de Maurienne and Valloire (Dauphiné, 4,000 ft.), just emerging on July 27th, 1896, on the hills of Grésy-sur-Aix, on July 25th and 26th, 1896, and other localities. The capture of the typical form of this species in abundance at Mendel from July 30th-August 3rd was interesting, as Dr. Chapman and Mr. Lemann had previously taken worn *Z. medicaginis* on the same ground, the species being quite over before *Z. loniceræ* appeared.

In a letter written to me in May, 1893, referring to the fertility of the hybrids of *Z. loniceræ* and *Z. trifolii*, which he had just proved so conclusively, W. H. B. Fletcher writes:—"I am not at all prepared to admit that the fertility of *loniceræ-trifolii* hybrids proves that these species are but one. Many hybrid plants are fertile, as are also some hybrid water-fowl. . . . I am inclined to think that *Z. loniceræ* and *trifolii* are good species." This opinion, from the entomologist who has had so much experience in breeding hybrid species, and from whose experiments all our data with regard to hybrid Zygænids have been obtained, is exceedingly valuable.

Barrett (*Brit. Lep.*, ii., p. 153) says that he has "described *Z. loniceræ* and *Z. trifolii* as distinct in deference to the universal admission of them as separate species . . . but they are exceedingly difficult to separate in the perfect state . . . But the difficulty has been very seriously enhanced by the discovery that they not only pair together with perfect freedom, but produce fertile eggs, which produce, in due course, moths having intermediate characters, or the characters in part of both parent races. . . . These experiments render it difficult to believe that what we call by the two names (*trifolii* and *loniceræ*) are more than local races of the same species very rarely found intermingled." We criticise this statement with some diffidence, knowing that Mr. Barrett is a firm believer in the original creation of species, a determined opponent of the principles of evolution in every shape and form, and a disbeliever in the efficacy of natural selection; still we are constrained to ask what explanations he would offer as to the following queries based on facts, so far as our own experience goes: (1) Why may one breed hundreds of either *Z. trifolii* and *Z. loniceræ* without getting any doubtful forms? (2) Why, if they are forms of one species, do they separate into one invariable form = *loniceræ*, and two variable forms = *trifolii* and *trifolii-major*? (3) Why these forms, being widely distributed over the British Isles and the Continent, maintain their absolute distinctness, with neither of them anywhere having a claim to be considered a local form which has diverged from the type? (4) Whether the mere fertility of the *loniceræ-trifolii* hybrids is sufficient to prove that they are but one, considering that

(as Fletcher has pointed out) many hybrid plants, water-fowl, and even cattle are equally fertile *inter se*? With all due deference to Mr. Barrett's opinions, I would urge that as evolution becomes more certainly patent as a factor now at work in determining species, and when more careful experiments have been performed on a large scale with the view of proving the fertility of hybrids, the more certain we are to find that closely allied species—of the nature of these *Zygaenae*—will give us fertile hybrid progeny. This, however, must not be allowed to interfere with the recognition of their specific distinctness in a state of nature. Oberthür writes:—"Ce qui complique la question, c'est qu'il est avéré que les *Zygaenae* de ce groupe s'accouplent facilement avec des papillons qui n'appartiennent pas à leur espèce" (*Lép. des Pyrénées*, p. 31); still, he does not on this account lump these allied species. Meyrick, whose weakness for lumping allied species to which he has not paid particular attention is well known, keeps the *Zygaenae* distinct, and writes:—"The species are very similar, often inter-breed, and are particularly liable to form local races, so that their study is excessively difficult." Kirby (*Butts. and Moths*, p. 92) writes of *Z. loniceræ*:—"Many experienced entomologists consider this insect to be only a variety of the last." With the exception of Barrett, we know no "experienced entomologist" who does this. Of course, plenty of collectors, who are not students, make the suggestion in their early days. It appears to us deplorable, from the scientific point of view, to attempt to unite such distinct insects.

I was not aware, when I wrote my note on *Z. medicaginis*, Bdv., and insisted on its specific distinctness from *Z. trifolii* and *Z. loniceræ* (*Notes on the Zygaenidae*, pp. 16-17) that Oberthür had already come to this conclusion, although his retention of Staudinger's name *dubia* for the species is quite inadmissible. As a practical field naturalist, who knows all these insects in a state of nature, we value his opinion, and find ourselves in almost absolute agreement with what he writes concerning them. He remarks:—"On distingue aisément la plupart des individus de *trifolii*, *loniceræ*, *dubia*, *jilipendulae* et *transalpina*, mais il est impossible de séparer avec une certitude complète certaines *Zygaena loniceræ* de certaines *dubia* ou même de *trifolii*" (*Lép. des Pyrénées*, p. 31). Of course, individual cases of difficulty will always occur in the location of such closely allied species.

Another statement fully bearing out my remarks (*Notes on the Zygaenidae*, pp. 16-17) that *Z. medicaginis* (= *dubia*, Stdgr.) is much nearer *Z. loniceræ* than *Z. trifolii*, a variety of which Staudinger makes it, is a quotation by South, who says:—"Christoph would appear to hold the opinion that *dubia*, Stdgr., and also *stoechadis*, Bork., are southern Alpine forms of *Z. loniceræ*" (*Entom.*, xxiv., p. 235). I have already suggested (*Ibid.*, p. 18) that *stoechadis*, H.-S. (from the neighbourhood of Cannes) is specifically identical with *Z. medicaginis*, but they are certainly distinct from *Z. loniceræ*, and Staudinger treats *Z. stoechadis*, Bkh., as distinct from *Z. stoechadis*, H.-S. Oberthür's remark that "il est impossible de séparer avec une certitude complète certaines *Zygaena loniceræ* de certaines *dubia*," also suggests a close alliance between these species.

It is generally assumed that *charon*, Bdv. (*Mon. Zyg.*, p. 65) *non* Hb. = *stoechadis*, H.-S., and that both are synonymous with *medi-*

caginis, Bdv. (*et* Led.). South, however, writes that "Lederer has observed that, in Transcausaria (? Transcaucasia, J.W.T.), *Z. filipendulæ*, gradually becomes changed into *transalpina*, Hb., and *charon*, Bdv. (two insects generally known under the name of *Z. trifolii* var. *dubia*)" (*Entom.*, xxiv., p. 234). We do not know Lederer's original quotation, but to say that the six-spotted *Z. filipendulæ* gradually becomes changed into an absolutely distinct five-spotted species (*transalpina*, Hb. = *charon*, Bdv. = *medicaginis*, Bdv.) is to make a statement for which there appears to be no foundation, and we take it that South's further remark, that *medicaginis* (= *dubia*, Stdgr.) "is connected by intermediate links with *Z. filipendulæ*," is based on Staudinger's diagnosis that *dubia* has "al. ant. macul. 5 vel 6." We have captured and looked over some hundreds of so-called intermediate links, and have found them all perfectly distinct from *medicaginis*, and referable to *ochsenheimeri*, Zell. (*vide*, *Notes on Zygaenidae*, pp. 20-21). The further remark that "our British five-spotted *filipendulæ* appears to fit here, and is, I think, really referable to *dubia*, Staud.," cannot be substantiated in the remotest degree, for these so-called "five-spotted *filipendulæ*" are usually referable to *hippocrepidis*, St. (*vide*, *ante.*, pp. 103-107), and show no alliance whatever with the purely Alpine species referred to here as *dubia*, Stdgr. (= *medicaginis*, Bdv.).

I observe that Millière unites *charon*, Bdv., and *dubia*, Stdgr., and reports of it: "En juin et juillet. Rare au mont Leuze, où M. Bryat, de Nice, l'a rencontrée." This author, besides treating *dubia*, Stdgr. = *medicaginis*, Bdv., as distinct from *Z. loniceræ*, of which he says: "On la trouve en juin dans les garigues," also separates both from *Z. stoechadis*, Bork. Of the latter, he says: "Elle n'est pas rare à la fin de juin, au mont Leuze, suivant M. Bryat, de Nice. La chenille (*lc.*, iii., pl. 107, fig. 1 à 6) vit sur le *Dorycnium suffruticosum*." Millière, however, makes *transalpina*, Hb., now generally recognised as a synonym of *dubia*, Stdgr., as a var. of *Z. loniceræ*, and makes it synonymous with Zeller's *ochsenheimeri*, and says of it: "Cette variété constante ne semble pas rare sur les pelouses bien exposées des environs de Cannes." This would suggest that Millière's own opinion was that *medicaginis* (*dubia*, Stdgr.) was a form of *Z. loniceræ*, his separation of *dubia* (= *charon*), as a distinct species, simply being based on M. Bryat's record of the form under another name, whilst one is not at all clear whether Millière's *stoechadis*, Bork., is not really *stoechadis*, H.-S., the latter of which is a Cannes insect (and a probable form of *medicaginis*), and yet is not mentioned by Millière. *Z. stoechadis*, Bork., according to Staudinger, is quite a distinct species.

I have already explained (*Notes on Zygaenidae*, pp. 15-21) my reasons for believing that Staudinger's original diagnosis of *dubia*, so far as relates to its having "sometimes five, at other times six, spots on the fore-wings," was due to the fact that he had united specimens of the six-spotted Alpine *Z. ochsenheimeri* with the five-spotted *Z. medicaginis*, both of which species sometimes cover the same ground, and, I believe, have been said to occasionally pair, although otherwise quite distinct. I have specimens of *ochsenheimeri* in my collection, sent out by Staudinger as var. *dubia*, and I have seen many in other collections. I have captured large numbers of *medicaginis* in various parts of the Alps, some of which occurred, and some of which did

not occur, in localities also inhabited by *ochsenheimeri*. Oberthür follows Staudinger here, and says: "Nous avons vu beaucoup de *dubia* avec cinq ou six taches aux ailes supérieures, mais jamais nous n'avons observé de confluence de taches dans *dubia*" (*Lép. des Pyrénées*, p. 31). We notice that Oberthür has not yet recognised *ochsenheimeri* as a Pyrenean species, and are inclined to think his specimens of six-spotted *dubia* (*medicaginis*) are really referable to this species.

I was much interested recently in re-reading some notes by G. T. Baker (-Bethune), on *Z. medicaginis* (*Ent. Mo. Mag.*, xxi., p. 9). The observations referred to were made in 1883, in the valley of the Buttier, between Aosta and the Great St. Bernard Pass, a district practically the same as that between Aosta and Courmayeur, in which my own observations (*Notes on Zygaenidae*, pp. 16-21) were made. His description of the occurrence of the species suggests that they occur in the same kind of places, and under similar conditions in the two adjacent valleys, and I have no doubt from his descriptions that the insects designated as "*a*" and "*b*" are *medicaginis*, whilst those designated "*c*" (only a single specimen) and "*d*" are males, and those "*e*" and "*f*" are females, of *ochsenheimeri*. The separation made by Mr. Baker is so identical with that I made myself, on my first acquaintance with these species, that there can be only such doubt existing, as must always exist, when the specimens are not actually under observation.

The remarks made, prefaced by Staudinger's diagnosis—"Zygaena, var. *dubia*, var. major, al. ant. macul. 5 vel 6, al. post. latius nigris"—are as follows: "Of this insect we took a large number in the Buttier Valley, in none of which are the central or basal spots confluent. The series is so interesting that I will describe them in detail:—

a. Fore-wings steel-blue, with the median spots red instead of crimson, and narrowly separated; hind-wings also red with a broad black border, spots on underside all disconnected.

b. Fore-wings bluish-bronze, with the spots crimson, smaller than usual, the median ones being more widely separated; hind-wings crimson with a broader black border.

c. Fore-wings bluish-green, with all the crimson-red spots very small, the median ones being very oblique, and still more widely separated, and the hind-wings having an exceptionally broad black border. On the underside of this specimen there is a distinct trace of a sixth red spot on the fore-wings.

d. Fore-wings greenish-bronze, with the crimson-red spots small and the sixth spot just visible (well marked on the underside); the hind-wings are crimson, with a broad black border. [In none of the foregoing are the anterior wings at all transparent.]

e. Green or blue-bronze, with markings similar to "*d*," but rather redder and the sixth spot becoming much more visible; the black border of the hind-wings is decidedly narrower and more uniform, and the underside of the fore-wings is suffused with red, and they have also a tendency to being slightly transparent, as is noticeable in *filipendulae*.

f. In this variety the sixth spot is well marked, and were it not for the very broad and blue-black border of the hind-wings, it might be mistaken for *filipendulae*."

With our own long series before us from the adjacent valley, we have no hesitation in referring *a* and *b* to *Z. medicaginis*, and *c*, *d*, *e* and *f* to *Z. ochsenheimeri*. Baker is "inclined to believe that considerable interbreeding must take place between it (*dubia*) and the six-spotted *Zygaenae*" (*Ibid.*, p. 10). Careful examination of the paired insects in the adjacent valley led me to believe that there was little or no intercrossing between the species, the apparent mixture being due

to the lumping of *medicaginis* (a five-spotted species) with *ochsenheimeri* (a six-spotted species, in which the males have the lower outer spot very ill-developed or absent on the upper side). It may be added that Mr. Baker and myself found typical *Z. loniceræ* in the Buttier and Dora Valleys respectively.

I think these notes cover all the records of value relating to the specific claims of *Z. loniceræ*, so far as they have been referred to in recent years in our magazines and other works. I trust I have made it clear that my observations of the living insects lead me to believe that *Z. loniceræ* is a distinct species from *Z. trifolii*, that *Z. medicaginis* (*dubia*, Stdgr.) is also a distinct Alpine species, much more closely allied to *Z. loniceræ* than to *Z. trifolii*, and that the so-called six-spotted *Z. medicaginis* are in reality specimens of *Z. ochsenheimeri*.

Are *Tephrosia bistortata* (*crepuscularia*) and *T. crepuscularia* (*biundularia*) distinct species?

(Concluded from p. 144).

By WILLIAM HEWETT.

The melanic forms are recorded from the following localities:—(1). *T. crepuscularia* ab. *delamerensis*, B.-White. — YORKSHIRE.—Rotherham, Doncaster, Edlington, Thorne, South Cave, Drewton Dale, Skipwith, Wentbridge, Wheatley Woods, Houghton, Sledmere, Strensall, Sandburn, Elvington, Hull. CHESHIRE.—Delamere Forest. WARWICKSHIRE. — Birmingham. DERBYSHIRE. — Bakewell, Derby. NOTTINGHAMSHIRE.—Mansfield. STAFFS.—Rugeley. GLAMORGANSHIRE.—Swansea, and from Ireland. (2). *T. bistortata* ab. *passetti*, Thierry-Mieg, is only recorded from Port Talbot, and the neighbourhood of Swansea, Glamorganshire, in both of which localities it appears to be common.

Doubleday, in speaking of the Warrington smoky forms, is doubtless referring to the ab. *delamerensis*, obtained by the Warrington collectors from Delamere Forest, Mr. Collins informs me that neither species occurs at Warrington.

It will be noticed that the following food-plants are given for the two species:—*T. bistortata*.—Plum, hawthorn, osier, blackthorn, fir, larch, poplar, elm, birch, willow. *T. crepuscularia*.—Birch, wild-rose (Perth), geranium, larch, plum, alder, willow, oak, knotgrass (J. A. Cooper).

The following points, among others, seem still to require elucidation:—(1) The number of eggs laid by *T. bistortata* (first and second broods), and *T. crepuscularia*. (2) Will *T. bistortata* and *T. crepuscularia* pair,* and will the hybrids be fertile or sterile? (3) Will the Perth form, considered by Mr. Tutt to be *T. bistortata*, pair more readily with *T. crepuscularia* or southern *T. bistortata*? (4) The examination of the eggs of more broods of the various forms of both species to ascertain whether the difference in size is constant.

The information I have received *re* the distribution of *T. bistortata*, fully confirms Doubleday's statement to Hellins, that the dark

* Dr. Ridg and Mr. Bacot have both answered this in the affirmative since the paper was read.—ED.

Tephrosia (evidently *bistortata*) "is far more difficult to procure than the pale one, being very local in this country."

I am not a believer in the immutability of species, or the special creation theory, but as firmly convinced as any of my readers that, in descent with modification by means of natural selection, and the consequent "survival of the fittest" theory, as propounded by Darwin and Wallace, we have the correct interpretation of the means by which species are evolved.

I am certainly of the opinion that *T. crepuscularia* is the species, and that *T. bistortata* is a sub-species, or a species in the process of development, but whether it will ever develop into a species, or be finally supplanted in the keen struggle for existence by the more widely distributed* and much more plentiful* *T. crepuscularia*, is another question.

That the specimens received by Mr. Barrett in 1886, from Derbyshire, were *T. crepuscularia*, and not *T. bistortata*, as stated by Mr. Barrett, I do not entertain the least doubt. The dates, April 12th and April 24th, agree very well for those of the former. *T. bistortata* does not occur in Derbyshire.

That the double-brooded specimens of *T. crepuscularia* (*biundularia*) referred to by Mr. Barrett, exist only in that gentleman's imagination, and that Mr. Tutt is quite correct in stating that a second brood of this species in nature is unknown, I am also firmly convinced. I observe also that Mr. Barrett seems to be unaware of the existence of April *T. crepuscularia* (*biundularia*).

[Since writing the above, Mr. R. Stafford, in a letter dated November 26th, 1896, states that "both species are double-brooded here (Pwellengare)," and this gentleman has sent me specimens of the second brood of *T. crepuscularia* (*biundularia*) as well as its ab. *delamerensis*. They are quite distinct from the second brood of *T. bistortata*.]

As I have no intention of allowing my interest in the *Tephrosia* question to flag, I should be glad to receive specimens, with dates and exact localities, from North and Central Europe, North Asia, Japan, North America, Shetlands, Orkneys, Hebrides, North Wales, Scotland, Ireland, or the northern, eastern and midland counties of England. I should also like information, together with specimens and particulars of geographical distribution, temperature and elevation of locality above sea-level, from any district not mentioned in my paper. I particularly want to know where the species have not been noticed by collectors residing in the district.

In conclusion, I wish to specially thank Messrs. Riding, Bacot, Mason, Prout, Robertson and Kane, who have each rendered me excellent service. To Messrs. Riding and Bacot I am specially indebted, as, without their most valuable aid, my paper would have lost much of its interest and scientific value. I must also thank most heartily all those gentlemen who have contributed to my paper, for their ready response to my many questions, and their evident wish to help me by every means in their power. They have very materially lightened my labours, and enabled me to place before you a great

* Is this true, except for the British Islands? *T. bistortata* has a marvellous range over the whole of the Palearctic and Nearctic regions. The distribution of *T. crepuscularia* is, so far as records go, much more restricted.—ED.

deal of reliable information as to the life-history, geographical distribution, etc., of the two species under discussion, as well as to clear up a great many errors and mistakes in connection with this difficult subject.

Contributions to the fauna of the Dauphiné Alps.

VII.—THE MOTHS OF BOURG D'OISANS. (*Continued from p. 142*).—
DOUBLE-BROODED GEOMETRIDES.—DIFFERENCE BETWEEN ACIDALIA
OCHRATA FROM DEAL AND DAUPHINÉ.

By J. W. TUTT, F.E.S.

GEOMETRIDES.—*Metrocampa margaritaria*.—One specimen only, in good condition; second brood evidently. Exactly like our British examples. *Iodis vernaria*.—One beautiful example came to light. It is, probably, a very abundant species in the district, as clematis grows everywhere. The species had been abundant in Kent in late June, so we suspected this must have been a specimen representing a partial double-brood. This is not known to occur, we believe, in England. *Nemoria porrinata*.—Of this little emerald, one specimen only, taken in a lucerne field. Exposure had, however, changed it from green to brownish. *Selidosema ericetaria* (*plumaria*).—One specimen only, in a lucerne field, a large male. This species is doubtfully double-brooded in Dauphiné and Southern France generally. We found the species moderately abundant on a piece of heathy ground at Grésy-sur-Aix, towards the end of August, in 1894. *Ematurga atomaria*.—This species, partially double-brooded in England, becomes evidently wholly double-brooded here. It was very abundant for the first two or three days of our stay only, when it became scarce—evidently over. The examples were large, with bright fulvous ground-colour, and very variable, in the direction of developing a bright yellowish coloration. The females were very fine, large and variable, and also roughly dimorphic, one lot grouping into fulvous forms, the other into grey. *Strenia clathrata*.—Rather common, the ground-colour usually white; we observed no specimens of the ochreous colour so common with us in England. *Strenia immorata*.—A few worn examples only, more like the ochreous Lewes examples, than is the grey form from Le Lautaret. The ♂ specimens were worn, as might be expected, considering the species was coming out a fortnight before at Le Lautaret (8000 ft. elevation); the females were in better condition. They disappeared entirely after our third day, so the species was evidently over. *Aspilates gilvaria*.—Rather common, and exactly like our British specimens. *Minoa murinata*.—One example only of the same brown form that we usually get in England. The grey form appears to be much rarer. It was the only form, however, seen at Bregenz, in August, 1895. *Anaitis plagiata*.—One very large and beautiful specimen disturbed. Very like a specimen captured on Ben Donich (Lochgoilhead), in August, 1893. *Eubolia bipunctata*.—Very abundant, and rather darker than our Kent examples. *Pelurga comitata*.—One worn specimen only came to light. *Camptogramma bilineata*.—Common in one or two spots. A pale form, inclined to greyish, with no distinct dark bands. Most of the specimens were worn, and the species was going over. *Melanippe fluctuata*.—Very like well-marked London specimens might be, with the basal area, costal and

apical marks well defined. *Melanippe rivata*.—One specimen only. *M. sociata*.—One example, in fine condition, with dark central band. *Larentia aqueata*.—A few specimens came to light, mostly worn, one only had the delicate green tinge which marks the recently emerged specimens. The habits of this species are very like those of its ally, *L. salicata*, to which it bears considerable resemblance as it sits on the rocks. *L. cyanata*.—One specimen only, which came to light. This was a small male. *L. infidaria*.—Two beautiful specimens of this species, which is closely allied to *L. flavicinctata*, came to light, one of each sex. *Coremia ferrugata*.—One example, in fine condition, at light. *Anticlea berberata*.—The Alpine specimens of this species differ considerably from British specimens, the black transverse lines being more continuous, and the brown markings absent. One finds it pretty generally distributed in the Alps, where barberry is very abundant; yet I never remember having seen the moths abundant. It came to light at Bourg. *Boarmia repandata*.—One worn example, also at light. *B. gemmaria*.—One specimen taken on a pine trunk, at about 4,000 ft. elevation. *Gnophos obscurata*.—One very dark example, captured at light, closely resembling the specimens from Perthshire. *G. dilucidaria* var. *mendicaria*.—A few specimens, in very poor condition, came to light. *Acidalia rubiginata* (*rubricata*).—This species was not at all uncommon in the lucerne fields, and on waste slopes covered with long rank herbage. The specimens appear to be just like our Suffolk examples. *A. ochrata*.—The specimens of this species were abundant on one little slope, overgrown with wild flowers and grass. They were much larger and more brightly coloured than our British examples, which are, indeed, the var. *perochraria*, St., the brighter, larger race of southern Europe being the type of the species. This was probably a second brood. The species used to be at its best at Deal the first week in July, seven weeks earlier than the date of capture at Bourg. *A. rufaria*.—One male specimen only, worn. *A. humiliata*.—One worn example only, without red costa. *A. aversata*.—A few specimens of the unicolorous grey form (ab. *spoliata*) only taken, the banded type not seen. *A. marginipunctata*.—One specimen came to light, of the same pale form that occurs in Kent. *A. ornata*.—Abundant, and in fine condition, on the same rough slope that *A. ochrata* frequented. *Emmelesia adaequata* and *E. minorata*.—Rather uncommon, at about 5,000 ft. elevation, on the mountains behind the village, the latter much worn, the former in good condition. We took the former on the Little St. Bernard Pass, on July 31st, 1894, at nearly 7,000 ft., flying, at dusk, in profusion. Here both species were evidently going over. *Eupithecia centaureata*, *Eupithecia impurata* and *E. nepetata*.—Used to come to light every night; the *E. impurata* were very fine. *E. tamariscata*.—One specimen only came to light. *E. sobrinata*.—One specimen only, also at light. Two other species of the genus *Eupithecia*, taken at light, are quite distinct from anything in the British Museum collection.

CRAMBIDÆ.—*Crambus pertellus*.—Perhaps common in some locality not explored. Several came to light, although we did not notice many specimens during the daytime. The specimens were all typically white, and not at all approaching the ab. *warringtonellus*. *C. inquinatellus*.—Not common. The few specimens seen were very typical. *C. culmellus*.—Common, the males with silvery-white fore-

wings. *C. tristellus*.—At light, not uncommon, and quite typical. *Homaeosoma nimbella* and *H. sinuella*.—Both species came to light. *Anerastia lotella*.—Both sexes came to light, probably from the marshy ground towards the Romanche. The specimens are redder than those examples of the species that I have captured at Deal. *Ilythia carnella*.—Both forms occurred, *i.e.*, the form with, and that without, a pale costa. *Dioryctria splendidella* (*abietella*).—Two specimens at light, one exceedingly fine. Both are specifically identical with specimens in my collection from Forres and Shoeburyness. The Dauphiné specimens, however, are very strongly marked.

PYRALIDES.—*Cledeobia* (*Actinia*) *brunnealis*.—Two specimens in a lucerne field, both males, disturbed in the daytime. *Ennychia cingulata*.—One very large specimen came to light. None observed on the wing. *Rhodaria sanguinalis*.—Brighter and yellower than the Wal-lasey specimens. They are very like individuals captured at Cour-mayeur and Aosta (Piedmont). The specimens taken here came to light. *Pyrausta punicealis* and *P. purpuralis*.—Were both captured, and not uncommon. *Hydrocampa stagnalis*.—One rather small male specimen came to light. *Botys flavalis*.—One specimen only, in very fine condition. It is very unicolorous, yellow, and with scarcely a trace of darker markings, probably the *ab. lutealis*, Dup. *B. repandalis*.—Not uncommon on the borders of the lucerne fields. In fine condition, of large size, and not at all so strongly marked as most of the specimens in the British Museum collection. *B. terrealis*.—A worn specimen only was captured. *Spilodes verticalis* (*cinctalis*).—Not uncommon, fairly large, *i.e.*, as large as our British specimens, and larger than specimens of the second brood that we captured at Bag-neux (Paris), in early August, 1893. These are also much more strongly marked.

PYRALOIDES.—*Depressaria ocellana*.—One specimen only came to light. *Psecadia pusiella*.—One specimen only of this species (so abundant at La Grave), found on a window. *Hyponomeuta cagnagellus*.—Common at light; the specimens quite typical.

ALUCITIDES.—*Alucita hexadactyla*.—Taken at light, and in the house (bed-room). Had the latter come in for hybernation?

PTEROPHORIDES.—*Mimaeseoptilus zophodactylus* (*loewii*).—Common on the same ground as *A. ochrata*. *Aciptilia pentadactyla*.—Common in the hedgerows and fields. *A. baliodactyla*.—Worn and scarce, probably going over. *Pterophorus monodactyla*.—One specimen only.

TORTRICIDES.—*Dichelia gnomana*.—Two or three specimens only, disturbed from the hedgerow by the side of the slope where *A. ochrata*, etc., occurred. *Sericoris cespitana*.—Generally common. *Penthina corticana*.—One specimen disturbed from the herbage near the hotel. *Carpocapsa pomonana*.—One specimen only, came to light.

ZYGAENIDES.—*Zygaena carniolica*.—Abundant in all the fields and lanes about the village. The greater number with the normal creamy rings very ill developed, and the central pair of spots often united (already described, *ante.*, vol. viii., p. 247). *Z. achilleae*.—The species was going over. I found only one or two specimens on the thistle-flowers with *Z. carniolica*. *Z. transalpina*.—This species was in splendid condition, of rather small size, and very abundant at a little elevation behind the village. Kirby says this is a "southern form of

Z. filipendulæ," a very bad shot for one of the most distinct of the Alpine species of *Zygæna*.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

EGGS OF LEPIDOPTERA.—*Fidonia conspicuata*.—Attached by flat side, in crevices, or against the roughnesses of the box in which the eggs are laid. A flat oval in shape; the micropylar end rather narrower. Length : width : height :: 4 : 3 : 2. A rather deep depression, markedly cellular in appearance, occupies the greater part of the central area of the upper surface. Colour green, with a series of raised longitudinal ribs running the whole length of the egg, and crossing the central depression. Fifteen of these can be counted on the upper half of the egg. They are apparently made up of a large number of raised whitish points, arranged longitudinally, and united transversely by short raised ribs running obliquely between the longitudinal ones, so that the egg in some positions appears to be honeycombed all over. The shell is shining, and white; the embryo within of a distinctly darker green colour. The micropylar area does not present a very distinctive appearance. It is composed of a rosette, formed of the endings of the longitudinal ribs, the micropyle proper, consisting of a smaller but similar rosette, situated centrally within the outer one. [Eggs laid April 22nd, described April 26th, 1897, under a two-thirds lens.]

Numeria pulveraria.—Of a plump oval in outline; length : breadth : height :: 4 : 3 : 2½, with an oval depression on the upper surface, occupying about half the upper surface. The shell reticulated with delicate hexagonal pittings, the pits arranged somewhat longitudinally, and more distinctly developed in the oval depression of the upper surface. Colour pale yellow, to the naked eye, pearly white under lens. The micropylar area is at the narrower end, not easily distinguished. It is composed of slightly elongated cells, arranged concentrically, with the narrower end of each cell pointing towards the micropyle; two rows of such cells visible, the inner one smaller. The micropyle proper is a very minute delicate stellate structure, situated in the centre of the micropylar area. The eggs (received from the Rev. C. R. N. Burrows) were laid indiscriminately, but singly, on the leaves of the food-plant and surface of a chip box, on April 25th. [Eggs described April 26th, under two-thirds lens.]

Aleucis pictaria.—Two eggs laid in the fork of a twig of sloe, a single egg in another fork. To the naked eye they appear to very closely resemble the colour of the bark of the sloe. Under a lens the eggs are seen to be almost covered with a number of tiny, short, stiff, pieces of transparent material resembling coarse silk, intermixed with black particles, probably broken scales, but with a distinct superficial resemblance to particles of coal dust. The eggs are so far covered that the structure is entirely obscured, and the eggs have to be washed for description. The egg is cylindrical, with rounded ends, the length : breadth :: 3 : 2. It is of a pale yellowish colour, becoming redder as it approaches maturity. The egg-shell is shiny, transparent, the contents of the egg examined (well advanced in development) of an almost uniformly blood-red colour. The central area of the egg is exceedingly minutely pitted, but at the two ends the pitting is much

coarser, and is very roughly but distinctly hexagonal. The micropyle is placed at one end of the egg, in the centre of a very slightly depressed area, which is composed of more regular cells than the surrounding parts. At the centre of this area is a minute depression, the micropyle proper, with four small black points, which give the micropyle a blackish appearance, under a very low power. [Eggs received from Rev. G. H. Raynor, described under a two-thirds lens, May 12th, 1897.]

Cerura furcula.—Of a deep purplish-black colour, with a somewhat dead, silky, appearance. The egg forms a little more than a hemisphere, the flat end forming the base. It is covered with an exceedingly close, but somewhat deeply cut reticulation, forming roughly, irregular, hexagonal cells, which are much more distinct on the shoulders and upper surface of the egg than on the sides. There is a tiny central cone (point) at the apex of the egg, the sides of which are covered with a more open network than the rest of the egg. The micropyle proper forms a minute stellate structure placed at the apex of this cone. [Eggs received from Rev. G. H. Raynor, described under a two-thirds lens, May 12th, 1897].—J. W. Turr.

Eurranthis plumistraria.—Eggs laid loosely. Somewhat cylindrical in shape, with rounded ends, a slight depression in the centre of the upper surface. The micropylar end much narrower than its nadir. There are 16 longitudinal ribs, which are pretty distinct centrally, but lose their character as ribs towards the micropylar and opposite ends of the egg. A series of raised white buttons on the longitudinal ribs terminate the less developed discontinuous transverse ribs. The transverse ribs form, with the longitudinal ribs, distinct and almost regular hexagonal basins over the whole of the upper fourth and lower third of egg. The micropylar area forms a distinct circular depression of a golden-brown colour, surrounded by small, modified, more regular, hexagonal cells, the white buttons absent on the margin of the depression. The inner micropylar area is much darker, with a ring of dark cells enclosing a circle of lighter-coloured and much smaller cells, in the very centre of which is the micropyle. The colour of the egg appears to be dull greenish to the naked eye, but under the microscope it is a pale, shining gold, the whole surface minutely roughened. The arrangement of the white buttons is very remarkable. At the two ends one is placed at each corner of the hexagons, with which these areas are covered. In the central portion of the egg, the white buttons are arranged thus . . . along the longitudinal ribs; this arrangement is due to the fact that the alternate buttons belong to transverse ribs, which cross to the next longitudinal rib on opposite sides. The white buttons are very ill-developed over the area occupied by the central depression. [Eggs laid April 28th, by a ♀ captured at Digne. Description made May 4th, 1897, under a two-thirds lens.]

Hemerophila abruptaria.—The eggs are laid partly upon each other, more or less imbricate. In shape they are broadly oval (not unlike a hen's egg), the micropylar end much broader than its nadir. The length : breadth : height : : 5 : 3 : 3. There is a slight lateral depression on one side. The colour of the egg is, at first, bright green, becoming pinky-red (to the naked eye) as the embryo matures. The shell is shiny, with a golden tint, and the colour, under the microscope, at first bright green, becomes brownish-red. The whole surface

of the egg is covered with a network of hexagonal cells, with a glistening white knob or button at each angular point (here and there heptagonal and pentagonal cells exist side by side, where one of the knobs has migrated to an adjacent cell). Each cell is depressed with raised edges, and the ground of the cell is minutely pitted. There is no definite arrangement of the cells into longitudinal and transverse lines, and the buttons of the cells directly surrounding the micropylar area are less prominent, not so large nor so shiny. The hexagonal cells are occasionally very regular, but usually more or less irregular. The micropyle is placed at the bottom of a small depression, situated centrally at the broader end. In the green stage of the egg, it is most difficult to distinguish, but becomes more conspicuous with the darkening of the colour. It is exceedingly simple, being formed of a number of rounded cells with a stellate arrangement. [Eggs sent by Mr. Bacot, May 14th, in the green stage, described May 17th in the red stage, under a two-thirds lens.] The close resemblance between the sculpture of this egg and that of *Eurranthis plumistraria* is very striking.—T. E. BARTY.

NOTE ON THE NEWLY-EMERGED LARVA OF *POLYGONIA EGEA*.—The newly-emerged larva of *P. egea* is very like a Noctuid larva (say that of *Dasyampa rubiginea*, for example) on emergence from the egg. After the first moult it bears considerable resemblance to the larva of *P. machaon* in its first skin, so far as regards tubercles and hairs; but it is far more specialised than the larva of *P. machaon*, both as regards the arrangement of the tubercles or processes (*i.e.*, embryonic spines), which are not in the usual trapezoidal form, and also in both having a central dorsal row of these processes or spines.—A. BACOT. May, 1897.

SCIENTIFIC NOTES AND OBSERVATIONS.

DISCUSSION ON THE ATTRACTIVENESS OF LIGHT.—The attractiveness of light has often puzzled me, and I cannot see my way to any explanation; but can imagine that, in some way, it is connected with an insect's sense of colour. Bees, as Sir J. Lubbock has shown, are very sensible of colour, and mostly attracted by blue. Night moths seem to find yellow and white flowers out, as most night-opening and night-scented flowers are one or other of these, *e.g.*, the night-flowering *Silenes*—*nutans*, *maritima*, *noctiflora*, *inflata*, etc., as against the allied red *Lychnis dioica* (sometimes placed among the *Silenes*), *Nicotiana affinis*, which only wakes up of a night, and many others, all of which are specially adapted for fertilisation by nocturnal insects. Once allow the attractiveness of a white flower to a nocturnal insect, and the influence of light becomes explicable, for a light would surely act on that insect in a much stronger manner.—E. A. BOWLES, M.A., F.E.S., Waltham Cross.

Mr. Bowles' explanation of the attractiveness of light is ingenious, but white and yellow flowers may only be attractive at night by being more conspicuous, and moonlight nights ought thus to be the best to capture moths at flowers, which is contrary to experience. Are white and yellow flowers the most attractive? The red nettles, red clover, rush bloom, red verberna, geraniums, red valerian, and many others, are all very attractive. We must account for the fact that insects come far more freely on dry evenings, and after a

spell of dry weather, than on rainy nights, though these send some visitors to our moth traps. The effect of light on insects seems such that, once drawn within its influence, they seem hardly capable of escaping. Yet we see others of the same species, pass and re-pass the light without noticing it. As a general axiom, it may be laid down that the drier the atmosphere (east winds excepted) the better will be success at light. Moonlight, of course, settles the question, but, given a warm night, after a dry interval, and species generally swarm. I once had 45 species in my room on such an evening. Moths come early, but the bulk arrive between 10 p.m. and 2 a.m. One condition is, however, a *sine quâ non*, viz., absence of wind, and, in working street lamps, such as are in a sheltered place are by far the best. The cause of the attractiveness of light is a matter that would well repay study.—C. FENN, F.E.S., Lee.

My most successful evenings at light have been damp ones; the dry ones are distinctly less successful. So far as I am guided by rule at all, it is that I look upon wind (especially east wind) as the chief deterrent to success at light.—J. C. MOBERLY, M.A., F.E.S.

The working of light (so far as shop windows and street lamps are concerned) is not very productive in this district. Only when I wish to obtain *Scoparia cembrae*, do I make a raid on the shop windows, and then I am most successful on fine calm evenings. The electric light in the works of the Steel Co. of Scotland, at Newton (near Glasgow), attracts a number of *Dasypteria templi*, every autumn.—A. ADRIE DALGLISH.

I have not found light pay at Portland, except in the autumn, when *Heliophobus hispidus*, *Epunda lichenea*, etc., are much attracted by it; but all specimens so attracted are males. I do not think that the female of *H. popularis* is often attracted by light, though, when this moth is common, the males come in great numbers.—N. M. RICHARDSON, B.A., F.E.S.

Mr. Fenn's criticism on my "ingenious explanation" is not so hard on me as it at first appears. For instance, it is because pale yellow and white flowers "are more conspicuous at night" that I mentioned them. It is a fact that they reflect certain rays of light instead of absorbing them, as red and blue would; these rays affect the eyes of insects, the flowers are seen and visited, and a feast of honey benefits the insect and fertilizes the flower: both are encouraged to continue, and, a natural habit of being attracted by light objects, in expectation of honey, grows up in the insect, and night expansion and pale coloring are fixed in the flowers visited. Coming to Mr. Fenn's moonlight criticism, I think I see neutralizing + and — signs. Thus, he says, "given a warm night," and we know that to be moonlight a night must be clear, and clear nights are cold nights, and insects fly not on cold nights. Again, of course, given sufficient moonlight, any flower would be conspicuous, and the insects so widely distributed, that to wait at any particular patch of flowers for them, would not pay. I do not deny that red flowers are attractive, but it is chiefly by day and often by scent, as in the clover, verbenas and nettles cited, which are chiefly fertilized by diurnal insects. But it is only the attractiveness of light at night that we are discussing, and I maintain, in answer to Mr. Fenn's query—"Are white and yellow flowers the most attractive?" By

night, certainly—Yes! for the majority of flowers specialized for fertilization by nocturnal insects are either pale yellow or white. In support of which see Kerner's *Nat. Hist. of Plants*, vol. ii., p. 196: "That scarlet flowers are not visited by hawk moths, owl moths, and other crepuscular and night-flying animals is obvious, since, when twilight falls, scarlet, as well as purple-red, violet and blue flowers become invisible. At this time only those flowers can be seen which are coloured white or yellow on the side turned towards the flying animals, as for example the evening primrose, honeysuckle, some *Nyctagineae* (e.g., *Mirabilis longiflora*), many *Solanaceae* (e.g., *Nicotiana affinis*, *Datura stramonium*), numerous *Caryophyllaceae* of the genus *Silene*, various species of *Yucca* and *Calonyction*, and, most of all, the large flowered Mexican cactuses of the genus *Echinocactus* and *Cereus*. When dark-coloured flowers are visited at night by insects, for example, those of *Hesperis tristis*, *Pelargonium triste* and *atrum*, it is not in consequence of the colour, but of the scent of flowers." In Grant Allen's *The Colours of Flowers*, p. 41:—"The day lychnis (*L. diurna*) has red scentless flowers, opening in the morning, and it is chiefly fertilized by diurnal butterflies. But its descendant, the night lychnis (*L. vespertina*) has taken to fertilization by means of moths, and as moths can only see white flowers, it has become white." In Sir J. Lubbock's *British Wild Flowers in Relation to Insects*, p. 11:—"Night flowers are generally white or pale yellow, these being the tints which render them most conspicuous in the dusk of evening."—E. A. BOWLES, M.A., F.E.S., Waltham Cross.

PRACTICAL HINTS.

Field Work for July and August.

By J. W. TUTT, F.E.S.

1.—In July and August, the females of *Stilbia anomala* are to be found early in the evening, sitting on the flowers of ragwort.

2.—The larva of *Cucullia gnaphalii* is to be found feeding on golden-rod, from the end of July to the end of August. The woods above Sevenoaks and Seal are well-known habitats for this rare species.

3.—The larva of *Hydroecia petasitis* feeds on the subterranean stem of *Petasites vulgaris*, in which it makes large excavations, during July. The large plants in a dry situation are the most likely to be affected. The pupæ should be dug up about the third week in August.

4.—During July and August the twisted heads of *Epilobium* should be collected for larvæ of *Laverna epilobiella*.

5.—The larva of *Peronea cristana* feeds between united hawthorn leaves in July.

6.—Towards the end of July and throughout August the imagines of *Fremobia ochroleuca* are to be found sitting in the centre of a scabious bloom, or that of *Centaurea scabiosa*.

7.—The imagines of *Aglossa cuprealis* are common in July and August, in the barns and stables attached to all the farms about Wicken (probably elsewhere). They sit on the woodwork among swarms of *A. pingvinalis* and *Pyralis farinalis*,

8.—The larvæ of *Sarrothripa undulans* (*revayana*) may be beaten from oak, in July.

9.—The larvæ of *Craniophora* (*Acronycta*) *lijustri* are sometimes to be beaten from privet hedges, in July and August.

10.—The plants of *Galium verum* should be well searched, in August, for larvæ of *Anticlea cuculata* (*sinuata*).

11.—The first week in August, the larva of *Hecatera chrysozona* is to be found stretched at length across the flowers and seed-heads of lettuce, in gardens.

12.—The second week in August is the best time to collect the galls made on the stems of *Polygonum aviculare*, by larvæ of *Asychna aeratella*. These should be exposed to direct rays of sun.

13.—The larvæ of *Gelechia scriptella* fold the leaves of maple, in August.

14.—Seed-heads of cowslips should be collected in August for larvæ of *Eupoecilia ciliana*. The larvæ want cork in which to pupate.

15.—Leaves of buckthorn, folded and fastened together the whole length of the leaf, should be collected in September for larvæ of *Phosopteryx derasana*. They do not pupate until spring, and should be given cork in which to pupate.

16.—During July, August and September, some white web over the mid-rib of elm leaves indicates the presence of the plain green larva of *Pempelia formosa*, which feeds openly by day on the upper surface of the leaves, and probably uses the web for shelter only at night.

17.—In the last week of July, on the banks of the river Bure, I found *Sericoris doubledayana*, flying gently among *Lastrea*, *Myrica*, and reeds, in the late afternoon sunshine. It is necessary to look for the moths, so little do they rise above the undergrowth (Meek).

18.—In early August, *Gelechia palustrella* flies directly after dusk, i.e., when it is actually getting dark, and may be then taken flying over the reeds, *Sparganium*, *Typha*, *Iris*, etc., that go to make up a veritable ditch flora. Later on it comes to light. I have taken it from 10.30 to 12.30 p.m. by this means.

19.—In July, the cones of *Gracilaria populetorum* are to be found on birch. The cone occupies an entire leaf, in which the green, rather transparent, larva feeds.

VARIATION.

ABERRATION OF *EUPITHECIA ABBREVIATA*.—I took, among other specimens of the same species, in April, at Swansea, a fine aberration of *Eupithecia abbreviata*, the middle of the wing being nearly white. —(Major) R. B. ROBERTSON, Wellington Court, Cheltenham.

AMPHIDASYD BETULARIA AB. DOUBLEDAYARIA AT FOREST GATE.—On May 23rd, I picked up a specimen of *A. betularia* ab. *doubledayaria* in this neighbourhood. As I have not seen any record of this aberration being taken in the London district, I thought perhaps it might be of sufficient interest to insert in the *Record*.—A. W. MERRA, 79, Capel Road, Forest Gate. May 24th, 1897.

NOTES ON COLLECTING, Etc.

DASYPOLIA TEMPLI AT SWANSEA.—I have been shown a male *Dasyptolia templi*, which was taken at Swansea in the autumn of 1896. This species is quite new to the district.—(Major) R. B. ROBERTSON.

RETARDED EMERGENCES OF *PETASIA NUBECULOSA*, AND HINTS AS TO PAIRING THIS SPECIES IN CAPTIVITY.—I had, in April, a few *Petasia nubeculosa* from 1895 larvæ. Pupæ of 1893 and 1894 of the same species are still standing over. I obtained two pairings of those bred, and obtained fertile ova. The insects are not difficult to pair if placed in a large box, and out in the open air or near an open window. I noticed that they did not copulate till the fourth or fifth night after emergence. The eggs were laid, scattered over the gauze at the top of the large box in which I kept the females.—T. MADDISON, South Bailey, Durham.

RETARDED EMERGENCE OF *NYSSIA HISPIDARIA*.—I bred a male *Nyssia hispidaria* this year, which had been three years in the pupal stage.—C. FENN, F.E.S., Lee, S.E.

SPRING LEPIDOPTERA AT CARLISLE.—A cold backward spring has caused lepidoptera to be correspondingly late in appearing, and with few exceptions they have been scarce. The sawflies were productive of little but the common *Tæniocampids*, yet these are quite as interesting as rarer species which vary little. I got a nice lot of *Tæniocampa stabilis* abs. *pallida*, *obliqua*, *suffusa* and *rufa*. The ab. *obliqua* is much the commonest form here. *T. instabilis* varied from a pale grey form with dark reniform to the extreme ab. *fuscata*. The type of *T. gothica* is rare with us; ab. *variegata* predominates. A few *T. populeti* turned up in two new localities; it is never common here. *Panolis piniperda*, usually abundant, was represented by one specimen. *Pachnobia rubricosa* was not scarce, but in poor condition. At rest on tree trunks, *Xylocampa areola*, *Tephrosia bimaculata*, and *Lobophora carpinata* were in fair numbers, while *Anticlea badiata*, *A. nigrofasciaria*, *Cidaria suffumata*, and *Coremia unidentaria*, were netted along hedge-rows at dusk. *Callophrys rubi* has been much scarcer than usual; two outings in quest of it only gave me a dozen. *Euchloë cardamines* is just coming on. Night searching for larvæ, with one exception, has been unremunerative: *Noctua triangulum*, *N. xanthographa*, *N. baia*, *Graphiphora augur*, *Triphaena fimbria*, *T. comes* (orbona), *Leucania lithargyria*, and *Melanippe montanata*, represent what I met with, the majority very sparingly. The exception to the general scarcity was *Noctua castanea*. The larvæ of this species have been very abundant on heath. Though most are to be swept at dusk, and during the night, a good many may be taken in the morning and in the late afternoon. During the middle of the day they appear to drop to the roots of the heath. I find that they feed voraciously on hawthorn in captivity, preferring it to their natural pabulum. A few *Aspilates strigillaria* were swept along with *N. castanea*, and also one or two *Lycophotia strigula*. Larvæ of the last named will not feed with me. A few days after being taken, I find them at the bottom of the breeding pot, dead or dying. The choicest sprays of heath they disregard, and I cannot get them to eat hawthorn or any other plant. On one of the "mosses" here, my friend Mr. Wilkinson and I met with larvæ of *Agrotis agathina*. In less than half-an-hour we swept twenty about half-an-inch long. While gloating over these, we were rudely interrupted by a gamekeeper, and our acquaintance with *A. agathina* in its haunts was abruptly terminated. A letter to the proprietor of the "moss," asking permission to collect there, was politely replied to in the negative. I am afraid that we shall not

rear the few we did get. They are looking very unhealthy just now, and eat next to nothing.—F. H. DAY, 6, Currock Terrace, Carlisle. May 17th, 1897.

EPICHNOPTERYX RETICELLA LARVÆ AT CANVEY.—On May 3rd, I obtained a good supply of larvæ of *Epichnopteryx reticella*, on a salt marsh at Canvey. It is necessary to lie down and search very closely for the cases, to obtain them in any numbers.—F. G. WHITTLE, 3, Marine Avenue, Southend.

SPRING COLLECTING AT SWANSEA.—Spring collecting at Swansea has been unsatisfactory. A few *T. bistortata* (melanic specimens were rare), *Xylocampa areola* (*lithoriza*) and *Lobophora lobulata* were taken at rest, and *Eupithecia abbreviata* was abundant at rest on oak, larch and other trees.—(Major) R. B. ROBERTSON, Wellington Court, Cheltenham.

TAENIOCAMPA OPIMA AT CANVEY.—I found a fine *Taeniocampa opima* at Canvey, on sea-wormwood, on April 19th.—F. G. WHITTLE.

MELITEA AURINIA IN IRELAND.—I have been very successful in getting the larvæ of this species into the pupal condition. I found a web in the winter, the larvæ have fed up slowly, and I have now, at least, 150 pupæ. The larvæ appeared to be very partial to warmth, collecting at the hottest corner of the cage, and becoming lively when the sun was on them. I noticed they continued to make use of a web throughout their larval existence. The pupa is a very beautiful object, and, suspended, it looks like the bud of some flower.—C. BINGHAM NEWLAND, Killetra, Mallow, co. Cork.

DASYCAMPA RUBIGINEA AND OTHER SPRING LEPIDOPTERA AT READING.—Of the early spring lepidoptera, *Hybernia leucophaearia* was well to the fore, the dark-banded forms not uncommon, and *H. marginaria* was in plenty. *Nyssia hispidaria* was not very well forward, but I had one good day's work at *Asphalia flavicornis*. Sallows produced fine forms of *Taeniocampa instabilis*, *T. gracilis*, *T. populeti*, *T. munda*, *T. miniosa*, *Calocampa retusta*, and *Panolis piniperda*, whilst sugar, on March 21st, produced three *Dasyampa rubiginea*. I took *Tephrosia bistortata* in the larch woods on the same date.—W. BARNES, Reading.

SPRING LEPIDOPTERA AT READING.—Collecting in our beech woods has been saved from utter barrenness during the last month by an occasional capture of *Stauropus fagi*. It has been on since April 26th. I have in various years captured it from April till July. It has appeared as a second brood in August from larvæ sleeved out of doors, and has been taken in our woods as late as November. What other large moth has such a range in time as this? *Tephrosia consonaria* is again all but absent. One female I took on May 4th. This, and one other specimen, comprise all those taken to my knowledge. The insect is seldom abundant; 1892 was a year of plenty; in 1893 it occurred sparingly, the number taken since could be counted on the fingers. *Platypteryx cultraria* and *Demas coryli* are scarce. *Leucophasia sinapis* is not out in its usual plenty. *Macroglossa bombylifformis* (the narrow-bordered species) flew freely 'in the sunshine to flowers of *Orobis tuberosa* on May 22nd, 24th and 25th. I have been, during May, eleven times to the beech woods, and have not seen *Tephrosia crepuscularia* (*biundularia*). It has been a good season for *T. bistortata*, but to date (May 31st) only two or three of its near relatives have been found on the beech. If the two were one species, the conditions favouring the one form should not be absolutely bad for the other.—J. CLARKE, Reading. May 31st, 1897.

STEGANOPTYCHA PYGMEANA AT KING'S LYNN.—I took a nice series of *Steganoptycha pygmaeana* this spring, by working on the sheltered side of a pine wood. Among the Micropterygids, I took, besides *M. subpurpurella*—which was as common as usual—*sangii*, *semipurpurella*, *purpurella*, *unimaculella* and *sparmanella*.—E. A. ATMORE, F.E.S. May, 1897.

EPICHOPTERYX RETICELLA AND LARVÆ OF CLISIOCAMPA CASTRENSIS AT QUEENBOROUGH.—The majority of the larvæ of *Clisiocampa castrensis* are now about half-grown. They are plentiful enough this year, but not, I think, quite so abundant as they were last year. It was such a glorious morning, that I was tempted to look for *Epichnopteryx reticella*, but I found only one specimen.—J. J. WALKER, F.L.S., F.E.S., 23, Ranelagh Road, Sheerness. June 6th, 1897.

LATE APPEARANCE OF PARARGE EGERIA.—I notice the imagines of *P. egeria* have been decidedly late in the date of their appearance this spring. *P. megera* was out in May with the first brood of *P. egeria*, which is unusual in my experience. It looks as if *P. egeria* can be delayed by unfavourable weather.—J. J. WOLFE, Skibbereen.

CURRENT NOTES.

The members of the Council of the Entom. Society of London will spend a few days in Oxford at the commencement of July as the guests of the Hope Professor of Zoology (Prof. Poulton, M.A., F.R.S., F.Z.S., etc.).

The second Annual Congress of the South Eastern Union of Scientific Societies was held at Tunbridge Wells on May 21st and 22nd, 1897. The delegates were warmly welcomed, and a Conversation was held, at which the Mayor was present. Mr. R. Adkin, F.E.S., represented the Sth. Lond. Ent. Soc.; Mr. S. Edwards, F.L.S., F.E.S., the West Kent Nat. Hist. Soc.; Mr. H. Mellon, the Bromley Nat. Hist. Soc.; Mr. A. J. Rose, F.E.S., the North Lond. Nat. Hist. Soc.; and Mr. J. W. Tutt, F.E.S., the City of Lond. Ent. Soc., so that entomologists were well to the fore. Papers, among others, were read by Messrs. Rose and Tutt. The Presidential Address, by the Rev. T. R. R. Stebbing, M.A., F.R.S., was an excellent piece of work. The heartiest thanks of the delegates are due to Dr. and Mrs. Abbott. Evidently this Congress may easily develop into a local British Association. Bromley has invited the Congress for 1898. Copies of the papers read can be obtained from the Secretary, Dr. Abbott, 2, Queen's Road, Tunbridge Wells.

Mr. J. H. Carpenter, of Shirley, Sutton, Surrey, has some first-class specimens of *Chrysophanus dispar* for disposal.

"A list of Portland Lepidoptera," by Mr. N. M. Richardson, B.A., F.E.S. (with an excellent plate, showing the life-histories of *Lita instabilicella*, Doug., *L. salicorniae*, Hering, and *Coleophora adjunctella*, Hodgkn., drawn by Mrs. Richardson), reflects the greatest credit on the compiler, and we owe him thanks for his interesting and useful notes on the various species. A local list like this is really a very important and necessary addition to an entomological library.

The meetings of the North London Entomological Society will in future be held on the *first* and *third* Thursdays in the month, so that they will no longer clash with those of the South London Entomological Society.

Mr. Champion (*E.M.M.*) records that *Exomias* (*Barypeithes*) *pyrenaicus* has occurred at Plymouth occasionally since 1888. He considers that *B. pyrenaicus*, which is treated by Dr. Seidlitz as a variety of *B. araneiformis*, is specifically distinct from the latter. Mr. Champion further notes that the insect standing under the name of *Lema erichsoni*, Suffr., in British collections, should be referred to *L. septentrionis*, Weise.

SOCIETIES.

THE CITY OF LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.—May 4th, 1897.—LEPIDOPTERA FROM DIGNE.—Mr. Tutt exhibited a box of insects of various orders, collected during March by Dr. T. A. Chapman. These, he said, were interesting, and the presence of freshly emerged specimens of *Colias edusa* and *C. hyale* supported the now practically proved view that they hibernated as larvæ, and pupated and emerged in early spring. Among other species captured were *Spilothyrus alceae*, *Thais polycena*, *T. medesicaste*, *Pieris daphidice*, *Anthocharis belia*, *Euchloë cardamines*, *E. euphenoides* (very fine examples of both sexes), *Leucophasia sinapis*, *Gonepteryx rhamni*, *G. cleopatra*, *Nomiades melanops*, *Polyommatus baton*, *Polygonia egea*, *Melitæa cinxia*, *Brenthis dia*, *Pararge egeria* (the southern fulvous form), *P. megaera*, and a magnificent series of *Erebia epistygne*, from Grasse. Among insects of other orders were many Hemiptera, Hymenoptera, Coleoptera, etc. Also several specimens of *Ascalaphus coceajus*, W. V. LARVÆ AND PUPÆ OF CHARAXES JASIEUS.—Mr. Tutt (for Mr. Stanley Edwards) exhibited a number of larvæ of *Charaxes jasieus* on the food-plant (*Arbutus*), which had been captured by Dr. Chapman at Cannes. He drew attention to the hood of the larva, and to the remarkable structure of the pupa. PORTHESIA CHRYSORRHEA ON OAK.—Mr. Tutt also exhibited larvæ of *Porthesia chrysorrhoea*, two nests of which Mr. Edwards had cut from oak in the neighbourhood of Digne. TEPHROSIA CREPUSCULARIA AND T. BISTORTATA.—Mr. Baco^t exhibited three broods of *T. crepuscularia* (*biundulata*): Nos. 1 and 2 bred from ova of the York form, and No. 3 from ova of the ab. *delamerensis*. The eggs of all three broods were sent him by Mr. Hewett; three broods of *T. bistortata* (*crepuscularia*): No. 1 from ova sent him by Mr. Hewett, who had received them from Major Robertson, No. 2 from ova which Mr. Hewett had received from Mr. Mason, No. 3 reared from eggs laid by moths of brood 2, that emerged last June. LARVA OF ANCHOCELIS PISTACINA.—Mr. May: a larva of *Anchocelis pistacina*, one of a brood bred from ova laid by a ♀ taken on Tooting Bec Common, September, 1896. EXOTIC COLEOPTERA.—Mr. Clark: a very fine exhibit of foreign Coleoptera, including the following: ♂ and ♀ *Chalcosoma atlas* (India), ♂ and ♀ *Odontolabis cuvera* (India), ♂ and ♀ *Ceratorrhina polyphemus* (W. Africa), ♂ and ♀ *Xylotrupes dichotormus* (Japan), ♂ and ♀ *Eurytrachelus titan* (Java), *Goliathus druryi* (W. Africa), *Batocera wallacei* (var.), *Chiacognathus granti* (Chili). OPORABIA NEBULATA AND OPORABIA FILIGRAMMARIA.—Mr. Prout: a representative series of named forms of *Oporabia nebulata* (*dilutata*); a variable series of *O. filigrammaria* from Ireland, Yorkshire, Bolton and Isle of Lewis; examples of the different forms which have by various authors been named *autumnata* (*aria*), namely: *autumnata*, Bkh., from Germany, a North Finland specimen agreeing

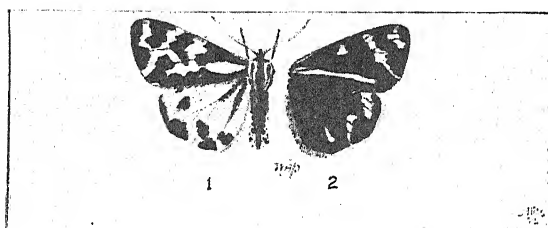
with the figure of *autumnata*, Gn., a large specimen from Scheeberg, received as *dilutata*, but agreeing in the genitalia with *filigrammaria* or *autumnaria*, and a short series of *addendaria*, B.-White = *autumnaria*, Weav.; also a bred specimen of *approximaria*, Gregson, lent by Mr. F. N. Pierce, of Liverpool; also larvæ of *nebulata* (*dilutata*) in the second, third, fourth, and fifth stages, and those of *filigrammaria* in the fourth and fifth stages. Mr. Prout read an exhaustive paper "On the genus *Oporabia*." Mr. Tremayne said he had once come across a specimen of this genus, presumably *O. filigrammaria*, in the Fairy Glen, Pennmaenmawr. It was resting on a trunk about 6 ft. from the ground, with the fore-wings slightly raised inwardly over the back, so as to leave the hind-wings slightly protruding at the sides, after the manner of *Gastropacha quercifolia*, when at rest. The month was September, and the specimen was a perfect wreck, but had evidently belonged to a strongly banded form. **EARLY APPEARANCE OF MELANIPE FLUCTUATA.**—Mr. Riches said that he had taken a specimen of *Melanippe fluctuata* on May 1st.

REVIEWS AND NOTICES OF BOOKS.

HARROW BUTTERFLIES AND MOTHS, Vol. II., by J. L. Bonhote, M.B.O.U., and Hon. N. C. Rothschild, F.E.S., F.Z.S., 1897. Demy 8vo., x + 112pp. [Published by J. C. Wilber, Harrow. Price 2/6.]—Some time ago we called attention to Vol. I. of this work; and all the praise we accorded the authors for that volume is equally well-deserved for the second. It is exactly what a local list ought to be—a record of the species occurring in the district, to which is attached the exact localities affected by each species, the authority for the locality, and a series of short interesting annotations concerning each species. It is full of information, and has an entomological value far beyond that of a mere local list. The keys to "the genus *Ennomos*" (*Eugonia*), to "the Apterous female Heterocera," to "the Acidaliidæ," to "the genus *Melanippe*," and the table for "the genus *Eupithecia*," as well as "the key to the genus *Eupithecia*," are worthy of all praise. There are, as is generally the case even in the best of books, a few unaccountable errors, such as *Acidalia trigeminata*, stated to be "found only in the western counties of England," the quotation that *L. straminea* may be distinguished from *L. impura* "by the post-median black marks in the hind-wings," a character which is well developed in some *L. impura*. (The thoracic crest, more pointed fore-wings, the central longitudinal shade of fore-wings and white hind-wings of *straminea*, are all better differentiating characters). Taken all round, the nomenclature is well up to date; but one is rather astonished to find Prout's corrections of the synonymy of *Acidalia dilutaria*, Hb. = *holosericeata*, Dup., and *A. interjectaria*, Gn. (*Ent. Rec.*, vii., pp. 124–125) not included, and we presume the book had gone too far to include Prout's later corrections as to the Tephrosias. But these are of little importance. *Harrow Butterflies and Moths* is a little book which all lepidopterists must obtain.

ERRATUM.—p. 90, line 11 from bottom, for "July" read "June."

NOTICE.—Owing to the summer holidays, the August number will be published on (or before) August 1st. All exchange notices, advertisements, etc., for this number, must be sent in early for insertion, otherwise they will be delayed until September 15th.



NEMEOPHILA PLANTAGINIS, ITS ABERRATIONS AND VARIETIES.

The Entomologist's Record

AND

JOURNAL OF VARIATION.

VOL. IX. No. 8.

AUGUST 1st, 1897.

Nemeophila plantaginis: its aberrations and varieties.

(Illustrated by Plate.)

By J. W. TUTT, F.E.S.

The British lepidopterist usually gets few good aberrations of *N. plantaginis*; yet, if each were to look carefully through his series, assuming that the specimens have come from different districts, he would probably observe that they show a considerable range of minor variation. The specimens from our northern and western mountains exhibit the greatest amount of variation, whilst those from the Scotch Highlands present many of the peculiar aberrational tendencies which characterise the species in different parts of its wider range—for, if the American *petrosa* be really only a specialised form of the ab. *hospita*, the species practically circles the north temperate region of the world.

There is, in the minor variation to be noticed everywhere, a distinct sexual difference to be observed. The male, with its pectinated antennæ, slender body, and rapid flight in the late afternoon sun, has rather more ample wings than the heavy-bodied female, with its slow and lethargic movements, which is rarely seen on the wing, and never at the time that the males are so active.

The pale markings of the fore-wings may be described as consisting of:—(1) A narrow longitudinal line at the base of the costa. (2) A central transverse costal streak, situated a little less than midway between the base and apex of the wing. (3) An oblique costal streak, running from a point situated on the costa (at about one-third from the apex towards the base) to the anal angle. (4) An apical streak (near apex) parallel to the preceding. (5) A longitudinal streak or band parallel to the inner margin.

I find, in my long series of British specimens, that the costal basal streak varies from complete obsolescence to a small rectangular blotch, broadest at some little distance from the base; occasionally it forms two distinct costal spots, which are very rarely continued downwards to meet the longitudinal streak (No. 5 above), thus reducing the basal portion of the black area almost to vanishing point. The central costal streak varies very greatly; sometimes it forms an irregular spot of variable size, cut off from the costa by the black ground colour; more generally it is connected with the costa by a narrow streak; at other times it forms a large irregular blotch, extending from the costa, and occasionally being connected with the central

longitudinal streak. The oblique costal streak (No. 3 above) is exceedingly variable, being usually broad and well-developed, and giving out from its centre two branches, one on each side, at right angles to the line of its direction, one joining the longitudinal streak at some distance before its termination, the other joining the lower end of the apical streak; occasionally, however, it is narrow and unbranched, or only branched on one side; when this is so, it is usually the inner branch (the one that joins the longitudinal streak) that fails first. The apical streak is usually lunular in shape, varies much in width, and is, more often than not, joined at its base to the oblique costal streak, as previously described. It frequently also, on its outer edge, gives off tiny pointed serrations, which occasionally reach the outer margin; very rarely it becomes so broad as to absorb the normally black apex of the wing. On the other hand, it is sometimes very much reduced, and then arrives at the normal condition of the American *petrosa*, the absence of this apical marking being very frequent in the latter form (or species). The longitudinal streak varies much in width, being broadest towards the base, and narrowing at about the centre of the wing; occasionally it is divided at this point into two distinct portions. We have before observed that it is frequently united by a branch line with the oblique costal streak (No. 3 above), and the lower side of the longitudinal streak often bears a prolongation as if the branch portion had cut right through it and had been continued on the outer side, and it is actually thus continued in a few of my specimens until it reaches the inner margin. The longitudinal streak usually ends before it reaches the anal angle; sometimes it bifurcates at its extremity, giving off two fine branches, one joining the base of the oblique line, the other running out to the margin at the anal angle.

The females are probably more uniform in the distribution of the black and cream colours of the fore-wings than the males. Compared with the latter, the costal basal streak is usually, perhaps, a little better developed, and the longitudinal streak often becomes wider, more often united with the pale costal streaks, and more branching at the anal angle. I have a female bred from larvæ, sent to me from Winchester, by the Rev. G. M. A. Hewett, in 1893, a male bred by the same gentleman in 1890, and another male bred by Miss Kimber, in which the cream colour greatly preponderates, and the black area is, of course, proportionately curtailed.

Whilst I have been examining my specimens for the above facts, my attention has been riveted upon a detail which appears to me to be of remarkable significance. It is, that *N. plantaginis* exhibits in its hind-wings an arrangement of the black and yellow markings perfectly parallel with that exhibited by the fore-wings. In fact, the modifications are so simple that one cannot fail to trace the peculiarity as soon as it is pointed out. Evidently, then, the markings of the fore- and hind-wings were at one time probably identical. It is necessary to get a long and variable series of specimens to work this similarity out in detail, but when such examination is made, there can be no doubt of the fact.

The black markings of the fore-wings may be said to consist of three oblique costal marks, and these have exactly analogous markings in the basal costal mark, the discoidal lunule and the upper spot

(occasionally produced to the costa as an irregular blotch in the female) of the hind-wings; then there is a similar longitudinal line joining the bases of these costal streaks in both wings; the black basal streak in both fore- and hind-wings is structurally identical; a similar irregular black band can be traced on the outer margin of both wings, whilst there is also a black spot towards the anal angle of the hind-wing, which evidently represents the insulated black mark usually found just within the anal angle of the fore-wing. This latter fact also gives us a clue as to the actual position of the anal angle on the outer margin of the hind-wing. Even the blocks formed by the union of these typical black markings show a remarkable parallelism in both wings.

But the yellow colour normally encroaches more on the black of the hind-wings than does the creamy colour on that of the fore-wings, and whilst the pale markings strike one as giving the pattern to the fore-wings, the dark markings do so to the hind-wings, and this is probably the reason why the parallelism mentioned above has not been described before.

The principal of these black (pattern) markings on the hind-wings may be described as:—(1) A short oblique costal streak not far from the base. (2) A central longitudinal streak starting from the base, and rarely extending beyond the centre of the wing. (3) A discoidal lunule united with the longitudinal streak. (4) A basal streak running along the inner margin from the base to the anal angle. (5) An outer marginal band. (6) An irregular spot (sometimes an extra small one above it) or blotch near the apex of the wing, rarely extended to the costa. (7) An insulated spot towards the anal angle.

Of these, No. 1 is rarely present in the male, but is very constant in female specimens, and is often blocked solidly with the central longitudinal streak. The latter varies much in width, from a fine line reaching to the base of the discoidal lunule, to a solid block, coalescing (as is often the case with the analogous markings on the upper wing) with the costal streak and discoidal lunule into a solid mass, extended frequently at the base (and more rarely throughout its whole length) into union with the basal streak, and still more rarely with the spot (No. 7 above), and through it with the marginal band. (This indicates the line of development of the aberration *matronalis*, Pl. V., fig. 2). The basal streak varies from a fine linear marking, extending from the base to about two-thirds across the wing in the direction of the anal angle, to a broad band reaching to the anal angle and to the inner margin, uniting at its extremity with the outer marginal band. When the costal streak, central longitudinal streak, basal streak and discoidal lunule become united into one large black blotch, as is often the case with the females, and more rarely with the males, the yellow ground colour is confined to a narrow band between the blotch thus formed and the outer marginal band. The spots, too, are frequently united with the large blotch described above, extending the dark area even more, and restricting the yellow colour to two or three elongated spots parallel with the outer margin. The direction of these yellow spots may be modified by the union of the black spots with the outer marginal band, instead of with the large central blotch; the yellow markings then fall within, instead of outside, them.

I have never, to my recollection, seen a British specimen of *N. plantaginis* with entirely black hind-wings, a condition which frequently occurs in the American *N. petrosa*, found in mountainous districts and previously referred to.

To return for a moment. The coloration of *N. plantaginis* is a deep velvety black with paler markings. In the males, these are usually of a rich cream colour in the fore-wings, bright yellow in the hind-wings, whilst a rich orange shade runs along the costa of the fore-wings, and reminds one of the somewhat similar red one in *Euthemonia russula*. In the females, the fore-wings are as in the males, but the hind-wings are usually of a more orange tint. But a well-known form is found in the Alps, in Scandinavia, in the Scotch Highlands, and probably throughout all the highest latitudes and altitudes of its extensive range. This form varies as much in the proportion of black and pale markings as the yellow form, but has the pale parts of the fore-wings of a delicate cream colour, of the hind-wings white. This is known as *ab. hospita*, Schiff., and Staudinger diagnoses it as "*alis posterioribus albis, nigromaculatis*," i.e., with the hind-wings white, black-spotted. Some of the more extreme forms, in which the dark streaks in the centre of the hind-wings are almost obsolete, are most striking (*ab. alba-obsolata*, Pl. V., fig. 1), but although the greater number conform more or less to the typical form in the distribution of the markings, others have the black spread over the wings to the same extent as is often prevalent in the yellow forms, and then = *ab. alba-matronalis* (Pl. V., fig. 2). The aberration *hospita* is not at all uncommon in the Scotch Highlands, and Mr. W. Reid, of Pitcaple, who has done so much for Scotch entomology, gives a most interesting account of its occurrence in Aberdeenshire (*Ent. Record*, vol. iii., pp. 57-58). I have received it also from the Dundee and Perthshire collectors. Mr. Newnham records it as not uncommon in Shropshire (*Ent. Rec.*, vii., p. 185, etc.).

Matronalis is Freyer's name for that aberration of the species with almost entirely black hind-wings, i.e., the form in which the pale-yellow colour of the type is restricted to a narrow, irregular band, or to a few spots parallel to the outer margin (*vide*, Pl. V., fig. 2). This form is rare in Scotland. I possess specimens given to me by the Dundee and Aberdeenshire collectors, and also a specimen received from the Darlington men.

Rare as these extreme forms are in Britain, they become more or less abundant at high elevations on the Continent. In fact, we should not be far out were we to call the species in some localities polymorphic. With regard to this polymorphic tendency, it may be well to quote Zetterstedt, who writes:—"The colour and markings of this species vary almost infinitely, and of 50 specimens which I have before me, scarcely two are alike. Besides the principal differences in colour—white, yellow and tawny—the markings vary also in form and number, especially in the hind-wings. In the white aberration—*hospita*, the posterior wings very often have only a few black spots, placed chiefly on the outer margin. In the yellow forms the hind-wings are very often black from the base to beyond the middle, then fulvous, with a few black spots scattered within the margin. Nevertheless, it is impossible to consider these different varieties, occurring together, as distinct species" (*Insecta Lapponica*, p. 930). The first

time that I saw this species in great abundance was amongst a bed of Alpine rhododendrons, at a height of about 7,000 feet, on that face of the Mont de la Saxe that slopes towards the Val Ferrex. It was towards the end of an afternoon in early August (about 5.30 p.m.), and they were flying wildly about. I netted a few specimens but having no empty boxes, brought none away with me, and we did not visit the spot again. However, I saw quite enough to learn how variable the species was. There were typical (yellow-) and *hospita*-coloured specimens of the *obsoleta* form, with apparently every intermediate form, so far as the black markings were concerned, in both colours (yellow and white), up to the real *matronalis* form. Then I saw several on Monte Rowan, on the afternoon of July 28th, 1895, but it was left for Dr. Chapman to get a long series of the species. This he did, finding it towards the end of August (1895), on a grassy and heathy slope on the north side of the Oberalp Valley, a mile below the pass, at about 7,000 feet in elevation. The males were flying freely in the afternoon sun, the females difficult to obtain. Out of fifty specimens brought home by Dr. Chapman, only two are females. The males, however, exhibit well the various phases of variation in markings that I have described. There are ordinarily three colour tints in the hind-wings—bright yellow (*lutea*), pale yellow (*flava*), and white (*alba*)—as distinguished by Zetterstedt, and as each of these colours give specimens exhibiting the three grades of markings in the hind-wings, *viz.*, the obsolete (*obsoleta*) represented by fig. 1, the typical, and the very dark (*matronalis*) represented by fig. 2, we may form the following table:—

- (1).—Bright yellow (*lutea*) form:—(a) ab. *lutea-obsoleta*, n. ab. (with few black markings on hind-wings, Pl. V., fig. 1). (b) *plantaginis*, L. (normal markings). (c) ab. *matronalis*, Frr. (hind-wings heavily marked with black, Pl. V., fig. 2).
- (2).—Pale yellow (*flava*) form:—(a) ab. *flava-obsoleta*, n. ab. (b) ab. *flava*, n. ab. (c) ab. *flava-matronalis*, n. ab.
- (3).—White (*alba*) form:—(a) ab. *alba-obsoleta*, n. ab. (b) ab. *hospita*, Schiff. (c) ab. *alba-matronalis*, n. ab.

One female, however, of the Oberalp captures has the hind-wings distinctly red, and I find this is occasionally the case in English, and frequently in Scotch, specimens. One with rosy hind-wings is mentioned by Mr. Horne (*Ent. Rev.*, iii., p. 58). This therefore gives us a fourth series:—

- (4).—Red (*rufa*) form: (a) ab. *rufa-obsoleta*, n. ab. (b) ab. *rufa*, n. ab. (c) ab. *rufa-matronalis*, n. ab. [In series, this would precede (1) above].

I have noted that the females of our British specimens frequently have an orange costal streak running along the edge of the fore-wings. This appears to become more common as we advance to the east, until, in Armenia and Caucasus, the costal area is red. Staudinger calls this race var. *caucasica*, and diagnoses it as: “*alis posterioribus subangulatis, alarum anteriorum costa in ♂, et in ♀, rufa*,” adding that it is probably a Darwinian species.

The large size of the abdomen of the female is frequently accompanied by a decrease in the wing area, sometimes also with a failure of pigment development. Indeed, pathological aberrations, in which one or both hind-wings have partly lost their pigmental matter, are not at all uncommon. The abdomina of the females also show marked colour dimorphism. Of 30 ♀ specimens in my series 28 have red abdomina, 2 yellow, an overwhelming preponderance in favour

of the red. The males, so far as I have observed, always have yellow abdomina. Another interesting phase of variation occasionally observed not only in this species, but also in the allied *Aretia caia* and *A. rillica*, is the development of a smoky hue over the normally yellow portions of the hind-wings. Mr. Horne (*Ent. Rec.*, iii., p. 58) refers to one, and I have at various times seen several similar specimens.

Before concluding, I would call attention to an article (*Can. Ent.*, 1895, April and May),* comparing this species with the North American *N. petrosa*, which is an extreme development, in its normal condition, of the *alba-matronalis* form, *i.e.*, in the direction of the excessive increase of the dark markings of both fore- and hind-wings. An excellent plate illustrates the article, and it will interest many of our readers to see what *N. plantaginis* may become in its far-distant and isolated localities. It is quite a moot point whether *petrosa* should be awarded specific or varietal rank, and it seems impossible to determine this until the early stages have been carefully compared by competent entomologists.

In conclusion, I would add that our readers might do worse than overhaul their series of this species, and carefully tabulate the aberrations captured in the various parts of our islands. Especially interesting would be the results obtained as to the distribution of the various forms by those whose specimens have come from the higher-lying and western districts of the British Islands.

* These numbers can be obtained, price 6d. each, from Rev. C. J. S. Bethune, Port Hope, Ontario, Canada.

Notes on *Charaxes jasius*: its life-history, protective resemblance, etc., with some observations on moulting and pupation.

By T. A. CHAPMAN, M.D., F.E.S.

LIFE-HISTORY OF *C. JASIUS*.—The interest attaching to this butterfly is very various. It is our largest European butterfly, though not, perhaps, incontestably so. It belongs to a group not otherwise represented in Europe, but characteristic of Africa, and especially equatorial Africa. It has a very handsome and curious caterpillar, whose habits are not, perhaps, very widely different from those of our own *Apatura iris*, which itself is one of our most interesting butterflies. *C. jasius* is found in Europe, only along the southern coasts, and, of course, only where its food-plant, *Arbutus undedo*, grows freely.

I first had the pleasure of seeing this butterfly alive thirty odd years ago, thanks to the kindness of a friend wintering at Mentone; but not till this spring had I the opportunity of searching for the larva myself.

It would appear to be sufficiently common in some places for local collectors, who know its habits, to obtain several hundred larvae during the winter, whilst it is still small, and not thinned by the many accidents that may befall during hybernation. My search was made late in March, when most are in their last skins, and when the numbers are certainly much fewer. On a fine day, at this period, one may not only fancy himself in Africa as searching for an essentially African species, but in the Esterels, where I made my search, *C. jasius* so affects the warmest situations, that the sun, even so early,

has some African suggestions. Nothing, indeed, is so striking, as regards the habitat of the larva, as the selection, not perhaps invariably, but so usually as almost to justify that word, of the very warmest available spots. The plants selected are on the southern slope of the hill, not too near the top, and even close down to the sea; they must not be in the shade of any other tree or bush; they must have a back ground of protection from the north, either of the *Arbutus* itself, or of other trees, rocks, etc.; a thinly-leaved bush standing alone is never tenanted. The larva is almost always on the south side of the tree, low enough down to have the upper part of the tree as a protection and shelter. The larva usually rests on the upper surface of a leaf, or of several leaves fastened together, by the silken carpet with which it clothes their surface, and which is necessary to give it firm foothold, and so commonly do these leaves so slope as to give an almost vertical exposure to the sun, that that may be described as the normal position. The larva appears to rest a good deal during the day, basking in the sun; though those I had in captivity were so comparatively sluggish, owing to cold and want of sun in a room, that a short exposure to the sun often roused them up and made them eat actively. To feed, they often appear to prefer to go to a neighbouring spray, not interfering with the normal appearance of their own. The larva does not appear to change its station often, sometimes, possibly, not at all, during the whole larval existence; but, often near a larva, a previous station can be found with its leaf clothed with silk; nor does the larva travel far to pupate—those on sprays in bottles never wandered further than the next spray to select a place to suspend themselves, nor, except when first brought home and thus severely disturbed, had they any tendency at any time to wander, so that a spray in a bottle sufficed for them, without the necessity for any cage or confining agency. Of course, I cannot be certain of their habits when young, but I fancy they are the same.

PROTECTIVE RESEMBLANCE.—Exposed in this way, one would suppose them to be very obvious on the trees, and no doubt when once one has trained the eye as to what it has to look for, they are not difficult to find. Still, the leaf on which the larva sits is usually surrounded by others, and the way in which the larva, seen from whatever direction, exactly imitates some aspect of leaves or buds under the different effects of light and shade, renders it possible for an untrained eye, in many instances, to look at it, and for it, for some time before seeing it. The yellow lateral line resembles the mid-rib of the leaf, seen from above or below according to light; the colour and apparent texture of the skin are the same as of many leaves. The extraordinary head, with its coloured jaws and spines, suggests in many aspects the little group of buds at the extremities of the branches. One has often to look a second time at certain leaves and branches, as well as at the buds, to be sure that they are parts of the tree and not a larva. The curiously coloured circles on the back of the abdominal segments 3 and 5, which are more brilliant with their blue and yellow than anything on an *Arbutus* leaf, nevertheless produce exactly the effect of certain little rings of fungus or decay, that are very common on the leaves.

In the mimicry of larvæ, it is to be noted that the larvæ do not so often exactly imitate the thing mimicked, as some particular aspect

of it under certain illuminations, and so here the larva is not at all like a leaf, but many leaves on a tree will look exactly like some particular larva does as it rests amongst them. In the same way the head does not resemble the buds at all closely, yet I have fancied I saw a larval head, when after all it was only a group of buds. Perhaps the most typical instance of this indirect mimicry is in the larva of *Acrionicta leporina*, which, seated beneath an alder leaf, looks exactly as if a spot of sunshine were falling upon the upper side of the leaf.

The pupa is a little paler than the larva, and of a bluish-green, and often has sundry white spots on the wings, but as I have not seen the pupa in its natural surroundings, it would be mere speculation to suggest the precise aspects of the leaves and branches from the resemblance to which they derive protection; but, since the young shoots are now forward, a different colour from that of the larva is obviously a probable necessity. The larva, by the way, never eats the young shoots and leaves, though they are often advancing before the larva is full-fed.

(To be continued.)

On the Classification of the Lepidoptera.

By J. W. TUTT, F.E.S.

It will be in the minds of our readers that in the *Ent. Record* (vol. viii., pp. 25-29) there is an article on "The relationship of the lower Lepidoptera with the Trichoptera," and in the *Trans. Ent. Soc. Lond.*, 1895, is another, entitled, "An attempt to correlate some recent Classifications of the Lepidoptera." Dr. Chapman's paper* in the *Trans. Ent. Soc. Lond.*, 1896, and the recent work of Dyar and Packard, have pushed the matter of the classification of the Lepidoptera a little further than indicated in those papers.

The "old order of classification so long accepted," as a well-known entomologist once fondly called it, was the division of the Lepidoptera into groups, according to the size of the insects, *viz.*:—(1) MACRO-LEPIDOPTERA. (2) MICRO-LEPIDOPTERA. It will be remembered that, on comparing Chapman's results with those of Comstock, Dyar, etc., we came to the conclusion, which we adopted, that Chapman's primary division of the Lepidoptera into INCOMPLETE and OUTCAST, was preferable to Comstock's division into JUGATE and FRENATE (which, indeed, Hampson had already shown to be untenable), from the facts that: (1) The two super-families—HEPIALIDES and MICROPTERYGIDES—comprised in JUGATE, although maintaining many ancestral features in common, were in reality in much closer relationship with other super-families than with each other, the MICROPTERYGIDES with the ADELIDES, the HEPIALIDES with the COSSIDES and ZEUGERIDES. (2) These two super-families formed the bases of two different evolutionary stems, each bearing many branches, with which they are more naturally related (and hence classified) than with each other. We were inclined to agree with Chapman's acquiescence in the separation of the ERIOCEPHALIDES, as a separate sub-order, from the rest of the Lepidoptera, and have provisionally accepted Packard's title—PROTO-LEPIDOPTERA—for

* "On the Phylogeny and Evolution of the Lepidoptera from a pupal and oval standpoint," T. A. Chapman, M.D., F.E.S., *Trans. Ent. Soc. Lond.*, 1896.

them. For the second of the above reasons, however, we have hinted that Chapman's divisions, *INCOMPLETE* and *OBTECTÆ*, will ultimately have to go, as they represent, as it were, horizontal slices of different evolutionary stems, and not distinct and separate stems.

In the *Trans. Ent. Soc. Lond.*, 1895, p. 346, we wrote:—"When, therefore, we find Chapman, Comstock, Dyar and Hampson agreeing that the pupa, the jugum, the generalised condition of the setiferous tubercles of the larva, and the low developmental stage of the neururation, all unite in indicating that the true place of the *MICROPTERYGIDES* and *HEPIALIDES* is at the bottom of the Lepidoptera, the conclusion must be looked upon as one not likely to be upset by the study of any other set of specialised characters, but, on the contrary, as one that will be rather strengthened thereby." The position of these at the bottom of the Lepidoptera, *i.e.*, as the more ancestral Lepidoptera, has been strengthened by the study of the scales (Kelllogg) and antennæ (Bodine); but we do not wish our readers to assume that, by placing them at the bottom of the Lepidoptera, we would unite them, as Comstock and Meyrick have done, into a section equal in value to all other Lepidoptera. On the other hand, we would keep them quite separate, as indicating the bases of two quite different lines of descent.

With regard to this matter, we have been charged with inconsistency, because, in our little book on *British Moths* (Routledge and Sons) we have not maintained Comstock's main divisions of *FRENATE* and *JUGATE*, but "have separated the *Hepialidae*, *Micropterygidae* and *Prioncephalidae* from each other by numerous families." Blandford considers that "the position, remote from all other Lepidoptera, that has been assigned to these three, is one of the most important and widely accepted of recent changes" (*Nature*). Of course, everyone who has studied them has recognised them as the most generalised of the moths; but no one has yet suggested that they have any direct alliance with each other, except that they have certain characters in common (generalised neururation, trichopterygoid scales, and jugum), which they have retained from their original hypothetical Neuropterid base. It is altogether asking too much that we should classify these families together, simply because both represent ancestral forms, and have retained a generalised form of neururation, and a jugum; whilst recent study makes it probable that they are in different lines of descent. The direct affinities of the Micropterygids are with the Trichoptera on the one hand, and the Adeliids on the other. Sharp, at the meeting of the Ent. Soc. of London, March 4th, 1896, exhibited specimens of the pupæ of *Micropteryx* (probably *M. semipurcella*), and stated that he considered "the pupa to be that of a Trichopterous insect," and suggested that the Micropterygids "should be treated as a group of Trichoptera, whose larvæ are not aquatic in their habits." He concluded that "if this course were not adopted, he felt clear that Trichoptera could not be maintained distinct as an Order from Lepidoptera." We are not prepared to admit this co-ordinal relationship. It is certain that the true affinities of the Hepialids are rather with the Cossids and Zeuzerids, and not with the Micropterygids; whilst the affinities of the Micropterygids and the Hepialids are only such as betoken a common ancestral origin, going back, probably, almost as far as Lepidoptera commenced to exist as such.

Chapman's latest paper (already referred to) has given us fresh clues for the real evolutionary stems along which the Lepidoptera have probably been evolved, and if it were not for the uncertainty relating at present to the GEOMETRIDES and PLATYPTERYGIDES, a very fairly complete genealogical tree might be constructed, comprising, at least, the principal families. Chapman's paper distinctly suggests three main stirpes, derived from a hypothetical base, which we may term: (1) The Sphingo-Limacodid stirps. (2) The Noctuo-Hepialid stirps. (3) The Pyralo-Micropterygid stirps. It is very doubtful whether the ERIOCEPHALIDES do not really represent a very ancestral form of the Pyralo-Micropterygid stem. At present, of course, they are considered as a separate sub-order, by Packard, and the arrangement would then fall.

Sub-order I. — LEPIDOPTERA-LACINIATA (PROTO-LEPIDOPTERA). — Erioccephalid stirps.

Sub-order II. — LEPIDOPTERA-HAUSTELLATA (PALÆO- and NEO-LEPIDOPTERA). — 1. Sphingo-Limacodid stirps. 2. Noctuo-Hepialid stirps. 3. Pyralo-Micropterygid stirps. As I have just stated, the super-families, about which one feels the least certainty at present, are the GEOMETRIDES and PLATYPTERYGIDES. We had always considered the former somewhat closely allied to the NOCTUIDES, and the latter to the PYRALIDES. The egg-structure of the GEOMETRIDES forbids the association of this super-family with the NOCTUIDES, and we are inclined to think it should be connected with the Sphingo-Limacodid stirps. The PLATYPTERYGIDES still appear to us to belong to the Pyralo-Micropterygid stirps.

As matters stand at present, it would appear that we are on pretty safe ground in making the following associations:—

Stirps 1. SPHINGO-LIMACODID Stirps.—*Cochliopodides*, *Zygaenides*, *Lasiocampides*, *Geometrides* (?), *Endromides*, *Saturniides*, *Sphingides*.

Stirps 2. NOCTUO-HEPIALID Stirps.—*Hepialides*, *Zeuzerides*, *Cossides*, *Tortricides*, *Nyctaeolides*, *Nolides*, *Notodontides*, *Liparides*, *Arctiides*, *Noctuides*, *Hesperides*, *Papilionides*.

Stirps 3. PYRALO-MICROPTERYGID Stirps. — *Micropterygides*, *Adeulides*, *Tineides*, *Sesiides* (?), *Psychides* (?), *Coleophorides*, *Crambides*, *Pyralides*, *Platypterygides* (?).

On the structural characters of Lepidopterous Larvæ.

By HARRISON G. DYAR, Ph.D.

I. LARVÆ OF BOMBYCES.—The larvæ of the Bombyces have tubercles^{*} iv and v remote, iv almost always moved well up behind the spiracle. The group is a large one, and covers a considerable range of characters. The most generalised families have simple single setæ, the subprimary ones present. This condition is seen in the Notodontidæ, Noctuidæ, Geometridæ, Agaristidæ, etc., which are very uniform, and give no characters which will separate the individual families. Specialisation takes place in the conversion of the simple tubercles into warts with many hairs. This has taken place in two types. In the first there are seldom any secondary hairs, and the warts

* The positions of these tubercles are described *ante*, p. 136.

on the mesothorax consist of but two above the lateral anteriorly situated one, or, if there are three, the lower of the three is rudimentary. This type appears in the *Arctiidae*, and their derivatives the *Lithosiidae* and *Syntomidae*, as well as in the *Apatelid* Noctuids, *Pericopidae*, etc. In the other type there are three thoracic warts above the lateral wart, the upper one of the three rarely becoming rudimentary. Secondary hairs are often present, and in the highest forms may become predominant over the warts. The hairy *Noto-dontians*, *Liparidae*, *Lemonia*, *Bombycidae* and *Lasiocampidae*, illustrate this type. Some of these groups are much specialised, and their structure can only be determined in the earliest larval stages. *Endromis* is an aberrant form, probably belonging here. The thoracic warts do not correspond to the type in stage i, and afterwards they soon disappear; but, judging from the Australian *Chelepteryx*, which seems closely allied, we have to do with a degenerate *Lasiocampid* form. Considering the size of this group, the larval characters run very evenly, and it is only in the most specialised species of the *Lasiocampid* stock that any doubt or confusion is likely to arise.

II. THE LARVÆ OF THE SATURNIANS.—The larvæ of the Saturnians are characterised by the union of tubercles iv and v, and the absence of the subprimary setæ. There is a strong tendency to the hypertrophy of all the tubercles, except ii, vii and viii, of abdomen, and to the union of the two tubercles i of the 8th or 9th abdominal segments, into a single unpaired dorsal process. In the simplest forms the setæ are single in stage i, though borne on elongated tubercles. Nearly all species have warts in the later stages, often much elongated or hypertrophied. The warts may be variously modified. I know of no species in which the single haired condition persists. Secondary hairs are often present. The group divides into two large types, and one of these into smaller ones, as follows:—

I.—A single dorsal tubercle on 9th abdominal segment.

(1).—A pair of tubercles on the anal plate *Citheroniidae*.

(2).—No tubercles on the anal plate; setæ converted into stinging spines *Hemileucidae*.

II.—No single tubercle on 9th abdominal segment *Saturniidae*.

The first two families are the lowest, and are only found in America. In the *Citheroniidae* there is a primitive first stage; the tubercles are elongated and branched, later several haired. All the genera, except *Anisota*, have the unpaired tubercle on the 8th abdominal segment. The *Hemileucidae* differ in the loss of tubercles on the anal plate, and the conversion of the setæ of the warts into strongly stinging poisonous spines, both characters of specialisation. The *Saturniidae* have a world-wide distribution, and a more considerable range in modification. In at least one genus (*Saturnia*) the dorsal tubercles of segment 8 are not consolidated. Most of the larvæ have short tubercles, with not many hairs, a few, or even many secondary hairs. There is no primitive first stage, so far as I know. In *Oriula* the warts are practically absent, and the larva is clothed with soft secondary hairs. *Aglia* is an unique form, with a quite generalised condition of the tubercles at first, but later they are entirely lost. The African forms have a tendency to smooth, sharp, thorn-shaped tubercles without secondary setæ. *Urota* presents a curious structure of many little smooth flattened warty excrescences,

developed at base of the short obsolete secondary hairs; the primary warts also nearly absent. The whole group of Saturnians is rather uniform, and without a wide range in the larval characters.

III. THE LARVÆ OF THE MICROLEPIDOPTERA OR TINEIDS.—The larvæ of the Tineids have tubercles iv and v in line longitudinally or united. In the lowest forms these tubercles are remote; the setæ are single and simple, and the subprimary ones are present. This is seen in the Plutellidæ. There are two different lines of specialisation. The original Tineid larva was probably an internal feeder, and one line follows out this habit. The larvæ have become leaf miners, and the setæ are remarkably reduced. So little material has been examined, that I am unable to say whether any of the subprimary setæ have actually disappeared, and this point is a good subject for future investigation. The other line of evolution is easier to trace, though it is more complicated. The first step is the consolidation of tubercles iv and v, as seen in some Plutellidæ and Gelechiidæ, and in all Cossidæ, Pyralidæ, Psychidæ and Sesiidæ. Next, tubercles i and ii consolidate (*e.g.*, *Butalis basilaris*), and after this the change of the tubercles to many haired warts occurs. As examples of this stage are Pterophoridæ, Zygænidæ, Pyromorphidæ. In a few instances there are secondary hairs, only in the Pterophoridæ, so far as I know. The final stage consists of a reduction in the subventral warts following a change in the mechanism of locomotion, whereby sucking discs are gradually substituted for abdominal feet. There is also a strong tendency for the conversion of the hairs into stinging spines. The beginnings of all these tendencies are seen in the Megalopygidæ. In the Limacodidæ they are completed, but also greatly modified in the several species. The Megalopygidæ possess, besides the ordinary abdominal feet on segments iii to vi and x, a series of paired sucking discs on segments ii to viii. The warts of the Limacodidæ have diverged into three types of change from the original Megalopygid structure. In the Palaearctic group the warts have degenerated and nearly disappeared, leaving a hairless granular skin, as in *Heterogena* and *Apoda*. In the American group, represented by *Phobetron*, the warts are elongated, often unequally, fleshy, and with short hairs of various structure. The third group retains the unequal fleshy horn-like warts, but the setæ are converted into stinging spines. This group is well represented in America and India, but seems to culminate, curiously enough, in Australia, where part of the horn-like warts have become retractile, the others spineless (as in *Poratifer vulnerans*, *lewini* and *casta*), and in other species even the whole structure remodelled into the smooth type by the loss of part (*Macytha semicana*) or all the warts (*M. infrequens*).

The development of the wing, wing-scales and their pigments in Butterflies and Moths.

By J. W. TUTT, F.E.S.

(Concluded from p. 162).

As to the chemical nature of the pigments in the scales, we know but very little. Hopkins has shown that the white pigments in the

Pieridae are due to uric acid. Mayer quotes this, and yet seems to have failed entirely to apply the self-evident deductions to his own observations on the white scales. Throughout his paper we read nothing of the pigments in the white scales of certain butterflies; but the general assumption is more than once expressed, that the colour of all white scales is due to their being devoid of pigment and to the reflection of light. Hence the justice of Chapman's criticism (*Ent. Rec.*, ix., pp. 78-79) becomes still more evident. Hopkins not only isolated this white pigment, but proved that under certain conditions it could be readily changed into yellow. It happens that the white Pierids, which have become mimics of the orange Nymphalids, have really changed their colour from white to orange. The chemical change, Hopkins has shown, is easy. Yet we know nothing as to how it has been brought about.

Hopkins has demonstrated that the pigment-factor in the wings of the *Pieridae* was of an excretory nature, containing uric acid. The production of the yellow Pierid pigment may be obtained by heating uric acid with water, in sealed tubes, at high temperatures. This "lepidopteriac acid," as the yellow Pierid pigmentary matter is called, is closely related to a red product, easily obtainable. To the practical entomologist it will at once occur that white, yellow and red are the three colours that function chiefly in the ornament of the *Pieridae*, and its importance is at once evident. The uric acid derivatives, however, appear to be confined to the *Pieridae* among butterflies, for when a Pierid mimics an insect belonging to the *Nymphalidae*, the pigments are chemically quite distinct. Griffiths (*Comptes Rendus Acad. Sci. Paris*, cxv., pp. 958-959) shows that the green pigment found in certain Papilionid, Hesperid and Nymphalid butterflies, as well as in certain Noctuid, Geometrid and Sphingid moths, also consists of a derivative of uric acid, which he also calls "lepidopteriac acid" ($C_{11}H_{10}Az_2N_8O_{10}$). By prolonged boiling in HCl it is converted into uric acid.

Since it is the modification of these pigments, into whose origin we have been enquiring, that produces variation in the colours of insects, I would return to the text on which I have repeatedly preached during the last few years, *viz.*, that all changes of colour in the scales of insects are but outward manifestations of the living activities and physiological processes of the animal in its earlier stages—egg, larva, pupa—or some interference with the normal course of these activities, or with its usual conditions of development. I need not here repeat what I have already published* on these heads, but the truth of which is being substantiated by recent enquiry, and it is quite evident that in studying variation we must consider the vital processes of the animal, and the peculiarities under which they are carried on, if we are to get a true conception of the actual causes of variation.

Mayer further states that, "in connection with the phenomena of pigmentation, it is interesting to note that, while uric acid may easily be demonstrated by the murexide test in the fluids of the alimentary tract of the pupae of the *Saturniidae*, it is never present in the hæmo-

* *Brit. Noctuae*, vol. ii., pp. i—xviii. "Variation considered biologically" (*Ent. Rec.*, vi., pp. 181, *et seq.*). "Pupal development and the colour of the resulting imago" (*Ent. Rec.*, iv., pp. 311—315), etc.

lymph of the imago, nor can it be detected in the drab-coloured pigment of the outer edges of the wings. The amount of uric acid in the fluids of the alimentary tract of the pupa increases as the pupa becomes older, so that the fluid which is voided upon emergence is always strongly impregnated with it. In the case of *Pieris rapae* there is no uric acid, either in the alimentary tract or hæmolymph of the larva, but it is present in the alimentary tract of the pupa. It seems to me probable that the uric acid of the alimentary canal of the pupa may be a product of the metabolism of the hæmolymph that is removed from the fluids of the body by the Malpighian tubules."

It is important to notice that Mayer's proof that the scales are formed from modified hypodermic cells makes them truly homologous with the hairs of Arthropods.

Another important fact insisted on by Mayer is that "the pupal wings exhibit two sets of corrugations or foldings, one being parallel to the trend of the nervures, and the other at right angles to it. In either cross or longitudinal section these corrugations appear as a regular series of ridges, and a single scale arises from the crest of each ridge."

He further writes: "Very large scales are found along the nervures and upon the outer edges of the wings in *A. archippus*. In fact, these scales are so large, that, after the protoplasm has withdrawn from them, a single leucocyte enters each one. These leucocytes soon degenerate, and finally disintegrate, without, however, contributing directly to the pigmentation of the scale. The fact that the leucocytes degenerate after entering the scales indicates that the hæmolymph within the scale is not in a normal condition."

Another point insisted upon by Mr. Mayer is that "dull ochre-yellows and drabs are, phylogenetically speaking, the oldest pigment colours in the lepidoptera, for these are the colours that are assumed by the hæmolymph upon mere exposure to the air. . . . Dull ochre-yellows and drabs are at the present day the prevalent colours among the less differentiated nocturnal moths. The diurnal lepidoptera have almost a monopoly of the brilliant colorations, but even in these diurnal forms one finds that dull yellow or drab colours are still quite common upon those parts of their wings that are hidden from view."

Since the above has been in type we have received from Mr. Mayer another brochure, entitled, "On the colour and colour-patterns of moths and butterflies." It is published by the Museum of Comparative Zoology, Harvard College, Cambridge, Mass., U.S.A., and is, in every respect, an essay which will still further enhance the scientific reputation of the author. Our readers who are at all interested in variation, mimicry, &c., must read the paper, or otherwise they must remember they have missed one of the best and most important of the papers yet published on these subjects.

Some named Varieties in the Larentiidæ.

By L. B. PROUT, F.E.S.

Lygris populata ab. *dotata* (? Linn.), Cl.—This is the form of *L. populata* with the central fascia not darkened, hence only indicated by its boundary lines. It is represented in many collections, and its occa-

sional superficial resemblance to *L. associata* is commented upon by Dr. F. B. White in *Faun. Perth.*, p. 26. I take occasion here to point out that the much-abused name, *dotata*, is to be abandoned entirely as a specific name. At the instigation of my friend, Mr. G. B. Routledge, who complained of the difficulty of correctly indexing the *Record*, I thoroughly sifted the matter. As long discussions of synonymy are not interesting reading, I will content myself with saying: 1. Linné gives a very brief and insufficient diagnosis in *Syst. Nat.*, Ed. x., which will apply to either of the allies; the type specimen in his cabinet is my *L. populata* ab. *dotata*. 2. Clerck's figure of *dotata* was long ago determined by Zeller and Werneburg for this same pale form of *populata*. Hence *dotata*, Gn., Dbld. *List*, retains the name *associata*, Bkh.; while *dotata* (? ? Linn.), Stgr., South's *List*, must be called *pyraliata* (? Fb.), Bkh.

Hydriomena autumnalis, Ström. (*trifasciata*, Bkh.) ab. *literata*, Don.—This figure (Don., *Nat. Hist.*, xiv., pl. 499, 2) is quite certainly the fuscous (or, according to the figure, rather *rust-coloured*), non-greenish form of *trifasciata*, Bkh. Guenée cites it to *H. ruberata*, and Staudinger, though adding a ?, has nevertheless (inconsistently with his general commendable practice) given precedence to the queried name; hence it has come into use on the Continent. Mr. South has wisely refused to substitute it for *ruberata*, Fr.

Anticlea nigrofasciaria ab. *ludovicata*, Mill. (*Ann. Soc. Ent. Fr.*, (6) vii., pl. 5, fig. 14).—This grand aberration, a single specimen, bred by De Rougemont, has the whole central area of the darkish-brown colour, which in this species is usually confined to a narrow inner bar. It thus associates a member of the genus *Anticlea* with the bulk of the allied "carpets" (*Melanippe*, etc., etc.), which have generally a dark central area. It would be interesting to learn whether any of our rich British collections contain similar instances.

Melanthia bicolorata.—This species is a very easy one to classify roughly into aberrations, and it may be worth while to clear up a little confusion which prevails. If we only allow two groups of forms, southern and northern, the names usually assigned—*bicolorata* and ab. *plumbata*—will do well enough. If we want to sub-divide the former, we shall get—(a) *Bicolorata*, Hfn. = *contaminata*, Hfn. = *astroemeriana*, Sulz. = *alba*, Ström. = *rubiginata*, Fb.—Central fascia as a spot on costa only. (b) Ab. *parvula*, Retz. (named on De Goer, ii., pl. 6, fig. 2) = *albaria*, Vill. = *rubiginata*, Hb. 250.—Fascia reappearing on inner margin as a single or double spot. But the northern forms are still better worth dividing into two, and it has to be pointed out that (as Mr. Adkin has already stated, *Entom.*, xxv., pp. 108-109) Curtis admits the banded Scotch form as *plumbata*, and, indeed, that is his type, though he also includes aberrations with the entire wing suffused. The forms will consequently be: (c) Ab. *plumbata*, Curt. = *virgata*, Tutt, *Ent. Rec.*, i., 321 = *fasciata*, Tutt, *Brit. Moths*, 273.—"Inclining to cream-colour; a fascia across the middle." This is the next stage to ab. *parvula*. (d) Ab. *fumosa*, mihi = *plumbata*, Newm., *Brit. Moths*, p. 155.—"The smoky-blue colour more or less spread over the wing." Owing to the confusion which I have mentioned, I believe this extreme form has never been especially named.

Contributions to the fauna of the Dauphiné Alps.

VIII.—LA GRAVE EN OISANS—SWEET LAVENDER—THE RHOPALOCERA OF LA GRAVE—ABUNDANCE OF POLYOMMATUS ESCHERI.

By J. W. TUTT, F.E.S.

La Grave en Oisans, between Le Lautaret and Bourg d'Oisans, is most delightfully situated. Perched on a rock, 5,000 ft. in height, it lies in full view of the fine glacier of La Meije, which stretches away to the south; whilst to the east and north the Col du Goléon and the Plateau d'Emparis extend to an elevation of some 9,000 ft. above the level of the sea. To the west the Romanche valley runs down between lofty, precipitous and glacier-covered mountains, into the Combe de Malaval, a ravine of picturesque grandeur, and almost unparalleled wildness. The steepness of its sides causes the glacial streams to fall over the rocks in magnificent waterfalls, whilst the *débris* is covered with forests of sweetest lavender. At the termination of the Combe is the hamlet of Le Dauphin, whilst a sterile, rocky valley lies between the latter and Le Freney, beyond which, again, is the magnificent gorge, L'Infernet, which is shut in by almost perpendicular walls of gneiss, which rise hundreds of feet from the bed of the torrent. This leads out at last at the Pont St. Guillaume to the valley in which Bourg d'Oisans stands, the Pont being at the junction of the Romanche and Vénéon rivers.

The collection of butterflies made at La Grave must be looked upon as somewhat of a fraud, from the fact that, during the week (Aug. 5th–12th) we were at this delightful place, we did not have a dozen hours of sunshine. All the butterflies were taken in three mornings' work of about two hours' duration only, so far as sunshine was concerned, added to an afternoon's walk from La Grave to Le Freney. We are under the impression that, given sunny weather, La Grave would have proved a perfect El Dorado of butterfly life. The following is an annotated list of actual captures:—

HESPERIDES.—HESPERIDI.—*Syrichthus albus*.—A series of about a dozen fine examples, captured on the slopes on the outskirts of the pinewoods leading up to the Glacier de la Meije. They were taken off the flowers, in the drizzle, whilst resting, with their wings over their backs in the most approved butterfly fashion. The range of variation was considerable. PAMPHILID.—*Thymelicus lincolni*.—Abundant on the slopes high up towards the Meije. Common also, but worn; on the roadside about a mile below the village. *Pamphila comma*.—A few taken at rest on the flowers, probably common.

PAPILIONIDES.—LYCENIDÆ.—*Chrysophanus virgaureae*.—This species was generally distributed, and evidently common. The ♂ specimens, however, were very worn. *C. hippothoi* var. *eurybia*.—Common on the rough ground directly at the commencement of the ascent to the Meije. The specimens appear very similar to those from Le Lautaret, the females with a slight coppery tinge on the fore-wings. *Polyommatus corydon*.—Abundant, the undersides, as usual throughout the district, very pale. *P. damon*.—Still more abundant. The specimens were of a deep purplish blue with broad outer margin, and very sparsely spotted on the underside. *P. escheri*.—On a steep shaly slope, with but little vegetation, this beautiful species was abundant, the males were in first-class condition, the females, probably, not out, at

least, I did not see any. On the walk down to Le Freney it was exceedingly abundant on the delightful lavender-clad slopes leading to the precipices on either side. It flew up repeatedly, too, from the runnels crossing the path, where it congregated with *P. damon*. *P. icarus*.—Rare. I only saw two or three specimens. *P. eros*.—One ♂ specimen, worn, on the slope below the Meije. Probably over. *Plebeius argus*.—Abundant on the same slopes, and in good condition. *P. aegon*.—By the roadside just above the village of Les Fréaux.

PAPILIONIDÆ.—*Parnassius apollo*.—Not abundant, but generally distributed all over the district. PIERIDÆ.—*Leucophasia sinapis*, *Colias hyale* and *C. edusa*.—None of these species were observed, either on the slopes behind La Grave, or on those leading up to La Meije. They all occurred in the Combe de Malaval, but only very few specimens were seen. NYMPHALIDÆ.—*Melitaea trivia*.—I have two or three worn specimens which I refer to this species. *M. phoebe*.—The males worn; two fine large females, in good condition, captured on the slopes some distance below the village. *M. cynthia*.—One female in moderate condition, taken from a flower, well up towards the Meije. No males observed. *Argynnis niobe* ab. *eris*.—A few specimens, in good condition, on the lower slopes leading up to La Meije. *A. aglata*.—On the same ground. The specimens of these two species were all exceedingly small. I once bred the former as small from Nürnberg, but have never seen *A. aglata* so small before. *A. lathomia*.—In fine condition, but rare. *A. adippe*.—Large and fine. On the flowers by the roadsides just below the village. SATYRIDÆ.—*Satyrus cordula*.—Both sexes. The females are of the form known as ab. *byce*. *Hipparchia hermione*.—In the Combe de Malaval. This species pairs in the afternoon. I took a pair *in cop.*, the ♀ with the wings hardly dry. *H. semele*.—The large Alpine form occurred in the Combe. I only saw the female. *Coenonympha satyrium* and *C. iphis*.—As at Le Lautaret, these occupied the same ground, but the bad weather prevented my capturing the species in numbers, or making any fresh observations. The form of *C. iphis*, that occurred at La Grave, was that which we have named var. *dauphini*. *Erebia tyndarus*.—Abundant on all the slopes leading up to the Meije. The form is a rather large one. The female brighter on the upperside, and the underside whiter than in the ♂. The underside of the latter dark grey. *E. scipio*.—Two worn specimens were captured near the summit of the Plateau d'Emparis, but the basal half of the fore-wings on the underside, up to the band, is quite dark. The species was evidently over; but even the worn ones were not to be caught on the steep slopes here. *E. euryale*.—Exceedingly abundant on the rough slopes up to La Meije, but very worn. The spotting of the specimens examined was very constant, *viz.*, three ocellated spots on the fore-wings. The underside near ab. *adyte*. The specimens taken in the valley between La Grave and Le Freney were much more ocellated. *E. neoridas*.—Not uncommon in the valley from La Grave to Le Dauphin, haunting the rough, stony slopes. *Melanargia galathea*.—Common, but going over. We would again reiterate here that the remarks made are subject to the consideration that the weather was altogether unsuitable for butterfly-catching, and that, therefore, many species were, probably, not seen that may be common, and that others, of which I saw but few specimens, are really by no means rare.

Entomology at the Royal Society.

The conversazione of the Royal Society was held at Burlington House, on the evening of May 19th. Entomologists mustered strongly. Lord Walsingham, Prof. Poulton, Dr. Dixey, Messrs. Blandford, Champion, Durrant, Elwes, Enock, Goss, Kirby, Lloyd, McLachlan, Meldola, Merrifield, Salvin, Trimen, Tutt, Verrall, and Waterhouse, were present. Mr. Blandford was in charge of a number of microscopes, etc., illustrating THE TSETSE FLY AND THE PARASITE OF THE TSETSE FLY-DISEASE, OR NGANA. The Tsetse Fly disease, familiar during the past fifty years as a scourge to domestic animals in Central and South Africa, has been recently shown by Surgeon-Major Bruce to be due to the presence in the blood and serous fluids of the affected animals of a parasitic Protozoon (*Trypanosoma*). Surgeon-Major Bruce has proved experimentally that the parasite may be present in the blood of wild animals shot in the "Fly Country," which, however, are not known to suffer from its presence. The part played by the fly appears merely to be that of communicating the micro-organism from infected to healthy animals. The disease of animals known as "Surra," in Asia, is closely allied to Ngana, and a similar parasite occurs in this country in the rat, but without producing the same fatal effects. Dried specimens of the fly, specimens of the Ngana hematozoon, both alive and stained, and of the rat hematozoon, were exhibited. Mr. Enock exhibited MICROSCOPIC PREPARATIONS OF THE MYMARIDÆ, a small family of parasitic hymenoptera, hitherto represented by some eleven genera, containing thirty-five species. This number has been recently increased by eight new genera, and many species. These most minute winged creatures (the smallest one eighty-fifth of an inch long) lay their eggs within those of other insects, which are thus destroyed by the tiny larvæ feeding upon the contained fluid, which is sufficient to sustain the parasite until it has reached maturity, when it bites a hole in the shell and escapes. It will be remembered that *Caraphractus cinctus* uses its wings for swimming under water. The exhibits of Dr. M. Standfuss, of Zurich, were most interesting, and we congratulate the talented exhibitor on the strength of mind that led him to trust such valuable material to the tender mercies of carriers. The LEPIDOPTERA RESULTING FROM TEMPERATURE EXPERIMENTS formed a most instructive exhibit, and placed side by side, as they were, with some of the more striking of Mr. Merrifield's specimens similarly obtained, their value was much enhanced. The HYBRID SATURNIUS, etc., were, if anything, still more interesting. The exhibit comprised the products of the crossing of various species, and the issue of these crossings by re-crossing the hybrid males with the females of the original species, or the pairing of these males with the females of a third species. A number of most interesting MONGRELS was also exhibited. These were, of course, the products of crossing various local races (varieties in the true sense of the word) of the same species. Mr. Merrifield's interesting exhibit consisted of INSECTS WHICH HAD BEEN ALTERED BY TEMPERATURE APPLIED IN THE PUPAL STAGES. The temperatures applied were roughly three, *viz.* (1) Forced, about 80° F. to 104° F. (2) Cooled, about 43° F. to 52° F. (3) Iced, about 34° F. Summer pupæ are generally much more affected than winter pupæ which, in most species, are not affected at all. The pattern appears generally to be most

affected by temperature in the early pupal stages. In the summer-pupæ of such a species as *Selenia tetralunaria*, the combinations of winter pattern with summer colouring, and summer pattern with winter colouring, were shown, by examples which were exhibited, to be capable of production in moths proceeding from the same parents. Lord Walsingham had an interesting exhibition of EXAMPLES OF GEOGRAPHICAL DISTRIBUTION AMONG THE MICRO-LEPIDOPTERA, illustrated by specimens and coloured maps, and the strange distribution of some small species, in which migration to their various habitats under present geographical conditions appears impossible, suggests strongly the notions (1) whether the insects are not to be traced back to a time when America, Africa and Australia were united, and (2) whether the insects have remained practically unchanged since they first occupied a continuous tropical habitat. The delicate and short-lived insects exhibited, being almost exclusively phytophagous, and frequently attached not only to the same genus, but to the same species of food-plant, appear to be not only altogether unadapted for migration, but also for artificial distribution, and it becomes exceedingly difficult to explain the distribution of the species exhibited, when it is further taken into account that the normal distribution of these insects is, with one exception, that of *Plutella cruciferarum* (which, by-the-by, Mr. Durrant says is not the correct name for this species), extremely local.

SCIENTIFIC NOTES AND OBSERVATIONS.

HYBERNATION OF *VANESSA IO*.—For the first time, I found, during the past winter, *Vanessa io* hibernating. Unlike those mentioned by Newman, the one I found was alone, and placed where its colour was not protective—on the underside of a flat stone. One day, late in February, it had gone, possibly my three or four visits had disturbed it, as I had to raise the stone on edge to see it. Anyhow, I saw no *V. io* on the wing this year until April. I usually see them in March, and last year saw one on February 9th.—J. J. WOLFE, Skibbereen, co. Cork.

THE GENITAL ORGANS OF *TEPHROSIA HISTORTATA* (CREPUSCULARIA) AND *T. CREPUSCULARIA* (BIUNDULARIA).—I have just come across the following note by Mr. Nicholas Cooke :—"There is a great difference between *Tephrosia crepuscularia* and *T. biundularia* in the structure of the anal appendages" (*Entom.* x., p. 95).—J. W. TUTT.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

Gonepteryx cleopatra.—Egg (of presumably this species) found on April 23rd, at Digne, on *Rhamnus*. Of a pale greenish-colour, resembling somewhat closely the colour of the undersurface of the leaf on which it is laid, and from which it stands out almost at right angles. On April 26th, the colour of the egg had become bright orange, except the apex, which was yellower. The egg is tall, spindle-shaped, the base considerably broader than the apex, gradually becoming wider from the base upwards to about the centre, and then gradually contracting to the apex, which is almost pointed. There are a dozen raised longitudinal ribs running from base to apex, and also very faint

transverse ribs, about 40 in number, faint pittings occurring between these. The micropyle forms a small darker-coloured crater at the very apex of the egg. [Egg described April 26th, 1897, under a two-thirds lens.]

Conopteryx rhamni.—The egg is described by Hellins as follows :—“Laid singly, generally on a rib of the underside of a leaf of *Ithamnus frangula*, but one leaf, which I picked, had two eggs on the underside and one on the upper. The shape of the egg is flask-like, cylindrical, set on end, about 1·3 mm. high, ;4 mm. in diameter at the base, ·5 mm. at the widest, narrowing to ·15 mm. at the top; the shell is very delicate and glistening, with twelve longitudinal ribs or flutings, and fine intermediate parallel lines; colour silvery-green at first, turning at last to yellow” (*Larr. of Brit. Butts.*, vol. i., p. 146). I have mislaid my own description of the egg, made in 1893, and can only find the following note :—“Just before hatching, the egg of *G. rhamni* turns to a dull brownish-grey colour, whilst the markings on the embryo appear, under a two-thirds lens, as a black spiral running up the egg from the base. The base is distinctly flanged, *i.e.*, has a flat outside rim, owing probably to the weight of the egg affecting its fluid condition when laid. The apex is rounded.”

Leucophasia duponcheli.—The eggs are attached to a leaf-stalk of the food-plant. “The egg is pale yellowish when laid, gradually turning a darker yellow” (Merrifield). It is a tall slender egg, of Pierid appearance, somewhat fusiform in shape, the basal attachment being wider than the apex, the latter being turned a little to one side. The basal attachment is circular and transparent, and the egg is of a deep orange colour (under the lens) above the transparent base. There are eight prominent longitudinal ribs, extending from base to apex, although occasionally two unite just before reaching the summit of the egg; they are bright silvery in appearance. The slender transverse ribs (50 in number) are very conspicuous where they cross the longitudinal ribs. The micropyle at the apex is placed in a very conspicuous depression, which fills up the whole of the apex. [Eggs laid May 5th, by females received by Mr. Merrifield from Dr. Chapman, from Digne; sent to me by Mr. Merrifield, May 11th, and described under a two-thirds lens on May 12th.]

Leucophasia sinapis.—One egg laid on the upper-side of the petal of a flower of *Lathyrus*, and a second on the under-side of a leaflet near the apex. They both stand out at right angles to the surface to which they are attached. The egg is of a pale yellow colour, the surface very shiny, somewhat fusiform in shape, but narrowing much more rapidly towards the apex than towards the base. The base is moderately wide, and from it the egg slowly increases in size, until it reaches about one-third from the apex, where it narrows off somewhat rapidly to the apex, which consists of a shallow depression, at the base of which the micropyle is placed. Looked at from above, the egg presents the appearance of a circle, bearing angular (12 and 11) points on its circumference. These are the longitudinal ribs, which are somewhat conspicuous, and run from the base to the apex. The surface is very finely ribbed transversely, about 42 ribs between the base and apex. The number of longitudinal ribs appears to vary; in the two eggs examined, they numbered 11 and 12 respectively. There is not such a well-developed base as in the egg of *L. duponcheli*, nor

has the basal part the transparent appearance noticeable in that species, but still it is moderately distinct, and there is a slight constriction in its upper part. [The eggs, for which I am indebted to Mr. Butler, were deposited on May 23rd by a ♀ captured on May 20th. The description was made on May 25th under a two-thirds lens.]—J. W. TUTT.

ON THE HYBERNATING LARVÆ OF *HIPPARCHIA SEMELE*.—I had eight or ten larvæ of *H. semele* last autumn. These remained small all the winter, although they fed a little occasionally, and showed no tendency to burrow, always remaining on the grass. They seemed less careful to hide in daylight than the larvæ of *Enodia hyperanthus*.—J. J. WOLFE, Skibbereen, co. Cork.

ON THE HYBERNATING LARVÆ OF *CENONYMPHA PAMPHILUS*.—From eggs laid last June, I had about a dozen larvæ of *C. pamphilus*. These grew very slowly, and attempted to go through the winter in the larval stage. Only two, however, managed to do so, the remaining larvæ dying off. The two that survived the winter were full-fed in April, when they died.—IMB.

LARVA OF *EUPITHECIA DEBILIATA*.—About $8\frac{1}{2}$ lines long, smooth, and of equal thickness throughout. Colour, very dark dull greenish-black. A broad black band runs down the back, bordered on each side by a yellowish-white band, which is divided by a slender black line. The larva rather reminds me, on a small scale, of *Abraxas grossulariata*. It feeds on the bilberry, and fastens two or three leaves together, in which it hides during the day.—W. J. KAYE, F.E.S., 37, Lower Hastings Street, Leicester. *June 29th, 1897.*

VARIATION.

ON THE VARIATION OF *STAUROPOUS FAGI*, AND THE PROTECTIVE ADVANTAGE OF THE COLOURS ASSUMED BY THE MELANIC FORM.—There are two distinct forms of this insect taken in this district:—(1) The type which is grey, and (2) the black form. The latter is a constantly recurring aberration. I have often wondered why this black form has had no varietal name given it. This matter, I think, deserves consideration. In the beech woods, the type can be picked out ten or a dozen yards away, but the melanic forms want close searching to find. Some years ago, in *The Entomologist*, I suggested the probability of the melanic form becoming more numerous by the process of natural selection. Facts, as far as they go this year, point in this direction. Then 25 per cent. of those taken were dark, now the proportion has risen to 30 per cent. In oak woods, I take it, the grey would be the better, and, perhaps, the only form protected, and the black should be extremely rare or absent. Is this so?—J. CLARKE, Reading. *May 31st, 1897.* [The best and most complete notes on the variation of this species, and on the special advantages offered for protection to the various forms by resting on different kinds of tree-trunks, are those by Mr. Holland (*E.M.M.*, xxviii., pp. 236-7) and those by Mr. Bayne (*Ent. Rec.*, iv., pp. 34-35). The latter summarises Mr. Holland's notes, and compares the habits of the imago at Reading, where it affects beech, with the habits of the insect in Epping Forest, where it affects trees with pale grey trunks, and where, under some con-

ditions, it would appear that the grey form is well protected, although, under other conditions, the melanic form is the better protected. The Linnean type is described as "rufo cinereis; fasciis duabus linearibus luteis flexuosis" (*Sys. Nat.*, xiith Ed., p. 846). Some specimens show a strong tendency to form a dark band across the fore-wings. This form might be well called ab. *virgata*. The deep brownish-black melanic form might also be called ab. *obscura*.—ED.]

PRACTICAL HINTS.

Field Work for August and September.

By J. W. TUTT, F.E.S.

1.—In the middle of September, the larva of *Phyllocolpa stachydalis* feeds on the leaves of *Stachys sylvatica*, living in a sort of tube, formed either by turning down the top of a leaf and folding it closely to the under surface with a quantity of silk, or else by drawing together a fold of the under surface, and covering it over with a thick silken web, in either case leaving an opening at the end. It comes out at night to feed. The larvæ are usually found low down on the plants, eating large holes through the substance of the leaves, but leaving the margin and veins untouched (BUCKLER).

2.—The spruce-fir cones should be collected during September for the larvæ of *Phyllocolpa togata*. They feed between the scales of the cone, upon the ripe seed at the base. The protruding frass makes an affected cone quickly recognisable.

3.—Seedheads of *Daucus carota*, collected in September, sometimes give imagines of *Depressaria depressella* the following month.

4.—The larva of *Ennemelesia decolorata* may be found in the flowers of the campion (*Lychnis dioica*) in August. Its presence is first made known by the half-eaten petals, and it is usually found within the calyx of the unopened flower-bud. Later on it re-enters the seed-capsule.

5.—The larva of *Anarta myrtille* should be swept for on heaths (covered with *Calluna*) with a circular net, which is better than beating into an umbrella for this species. August and September are the best months. Does this species still occur on Wimbledon Common (the side near the park)?

6.—In early September the conspicuous white mines made by larvæ of *Gelechia naxiferella* are to be seen in leaves of *Chenopodium*. At the same time, and on the same plant, the less conspicuous mines of *G. hermanella* are also to be found.

7.—At the end of August, sweep the flowers of *Calluna vulgaris* for the larvæ of *Phyllocolpa nanata*.

8.—During August, collect the twisted tops of osiers for the larvæ of *Earias chlorana*. The larvæ of *Peronea hastiana* are often abundant in a similar situation, a week or two earlier.

9.—*Tapinostola hellmanni*, usually supposed to be a fen species, occurs abundantly in Monk's Wood (Hunts) in August. It is much more abundant on the outskirts of Wicken Fen than in the Fen itself.

10.—Thistles in sheltered situations give, in early September, the cases of *Coleophora therinella*.

11.—In early September, the blotched appearance of the leaves of *sallow* betokens the presence of the larvæ of *Gelechia notatella*. On the same plant, and at the same time, the cones of *Gracilaria stigmatella* (in their white silvery-looking cocoons, on the underside of the leaves) are to be found.

12.—The larva of *Gelechia scriptella* is to be found feeding between united maple leaves, in the early part of September. The larva changes to a pupa, in a slight silken web in the folds of the leaf, towards the end of the month.

13.—Collect, in August and September, the seeds of gentian, *Pimpinella saxifraga*, wild carrot, etc.; place in flower pot, and expose all winter. In July next year, you will probably breed *Semasia rufillana*, (*Ecophora flavimaculella* and *Asychna profugella*).

14.—“The larvæ of *Pupithecica denotata* (*pimpinellata*) may be found in scores on the seeds of *Pimpinella saxifraga* in September. Some of the larvæ were green when the seeds were green, but later in the season, when the seeds were brown, the larvæ were chiefly brown” (HODGKINSON).

15.—During the first week in September, the cases of *Coleophora melilotella*, which are very like the dark seeds of *Melilotus*, are to be found on the latter plant.

16.—In August and September, the cases of *Coleophora wilkinsonella*, *C. limosipennella* and *C. paripennella* are to be found on birch. The larvæ hibernate full fed, but pupate next year without further feeding.

NOTES ON COLLECTING, Etc.

NOTES FROM THE ISLE OF MAN.—The cold winds experienced here during March and April, accompanied by heavy rains, completely destroyed the *sallows* for collecting. During the early part of the season, *Taenioecampa gothica*, *T. stabilis*, *T. instabilis* and *T. rubricosa* came freely to the bloom, but, after the first few days of storm, insects were conspicuous by their absence. At the time of writing, flowers of white pink are proving very attractive to *Choerocampa porcellus*, *C. elpenor* and *Dianthoea capsincola*. On the coast, *D. caesia* has occurred sparingly at flowers of *Silene maritima*, and *D. capsophila* has been somewhat scarce. The latter insect was on the wing by May 13th this season, and *D. caesia* on May 28th. In certain localities, *Setina irrorella* has been abundant, while larvæ of *Polia nigrocincta* (*vanthomista*) have been extremely rare.—H. SHORTRIDGE CLARKE, F.E.S., Sulby Parsonage, Isle of Man. June 15th, 1897.

PERONEA PERMUTANA AT BARNES?—I should like to ask a question about the reported occurrence of this species on Barnes Common. Stainton (*Man.*, ii., p. 235) gives “New Brighton and Barnes Common.” Gregson (*Entom.*, xiii., p. 46) says that “in 1851 he took the insect at Barnes Common.” Probably this was Stainton’s authority for the statement. The species was, a few years ago, more than once recorded from the same locality, by Mr. Gates, at the meetings of the City of London Entom. Society, but I examined some of these specimens, and found them to be the form of *P. variegana*, which bears a somewhat superficial resemblance in coloration to *P. permutana*. Has

the species really ever been taken there, or has the peculiar aberration of *P. variegana*, taken there, done duty for the species?—J. W. TUTT.

THE NEW FOREST AT WHITSUNTIDE.—On June 4th, 1897, the members of the North London Ent. Society started for an excursion to the New Forest. Lyndhurst was reached at about 10 p.m., although Messrs. Clive B. Smith, Bacot, and W. H. Smith were unable to get down till the following day. Part of the party put up at "Lynwood," the other part at the "Fox and Hounds." On Saturday, several of the members were early astir. Larva-beating in Beechen Lane was tried, with even less success than usual. Scarcely anything worth taking seemed to be about, though larvae of the commoner species were plentiful enough. *Hybernia defoliaria* was not for once the commonest larva, that honour being about evenly divided between *H. marginaria* and *H. aurantiaria*. *H. defoliaria* had probably mostly gone down. Of imagines, there were found a few *Pechypogon barbalis*, *Iodis lactearia*, *Acidalia remutaria* and *A. straminata*. The fences only yielded a fine specimen of *Hadena genistae* to Mr. Woodward. By 10 o'clock the day was broiling hot, and, soon after breakfast, the party, with the exception of Messrs. Harvey and Woodward, who preferred to go to Rhinefield, started for the celebrated "Knightwood" oak. Mr. L. J. Tremayne opened his entomological account with a specimen of *Acidalia trigeminata*, and Mr. C. Nicholson found a field where *Euchloë cardamines* was on the wing. As the party proceeded, it became evident that *Pararge egeria*, in all conditions, was also flying, *Gonepteryx rhamni* was ovipositing, *Brenthis euphrosyne*, apparently not fully out, was seldom to be seen more than one at a time, and several of the commoner Geometrids were to be had by beating. An insect which appeared to be in greater abundance than usual was *Formica rufa*. The route being *via* Bank, the party soon entered Gritnam Wood, where larva-beating was once more tried, and *Taenioctampa miniosa*, and full-fed *Zephyrus quercus*, together with a few *Psilura monacha*, began to come down. Before reaching the Lymington River, a halt was called, and Messrs. Bacot, Bishop and Jennings, finding collecting improving, decided to remain where they were, and Messrs. C. Nicholson and L. J. Tremayne were left to push on to the Knightwood Oak alone. They first turned into Rhinefield, where the President took a fine specimen of *Macraglossa bombyliiformis*, but no more were seen, and another collector on the ground stated that he had been there the whole morning and only taken three, of which one was worn. In the meantime, Messrs. Bacot and Bishop had augmented their larvæ by the capture of *Asphaltea ridens* and *Nyssia hispidaria*. Messrs. Harvey and Woodward, who had been to Rhinefield, had succeeded in capturing both the Bee-Hawks, and had turned up *Tanagra atrata*, and larvæ of *Bombyx quercus*. Messrs. Jennings, Bacot and Bishop had been attacked on the Christchurch Road by a species of *Tabanus*, which resembled *autumnalis*, but which Mr. Jennings thought must be a different species, as the specimens were worn. After tea, some of the members started for evening work. To begin with, Mr. C. Nicholson knocked down a flying specimen of *Asemum striatum* in the garden, and this was one of the very best captures made during the visit. Up to the year 1893, it had never been found in the South of England, being essentially a northern species, though occurring in a

certain locality in Cumberland. At Whitsuntide, 1893, a single specimen was taken in the New Forest by Mr. Bertram Rye, who again met with it in 1895, when he captured two specimens at Bookham, Surrey. It is, like all the Longicorns, a wood borer, and is attached to pine. It has been introduced from Scotland to the South of England, in young trees imported for planting purposes. At Hurst Wood, scarcely anything flew at dusk, a few *Melanippe montanata* being almost the only captures, though New Park was tried as being better ground. Sugar also was an utter failure, not attracting a single Lepidopteron. Larva-beating produced a few *Asphalia ridens*, *Zephyrus quercus* and *Psilura monacha*. Messrs. Harvey and Woodward, however, were successful in taking *Scodionia belgiaria* on Whitemoor. The next day was again intensely hot, and Messrs. C. B. Smith, Harvey, Bacot, Woodward, and Bishop left Lynwood, after breakfast, for Beechen Lane, Denny and Matley Bogs, and Stubby Copse. Beating in Beechen Lane, Mr. Bishop brought out a specimen of *Epione adrenaria*, and Mr. Bacot one of *Gnophria rubricollis*. *Bombyx rubi* was found commonly on the heath near Denny Bog, as well as a few *Saturnia carpinii*, Mr. Woodward also took *Lithosia mesomella* and *Gnophria rubricollis*. The larvæ beaten were those of *Taeniocampa miniosa*, *Asphalia ridens* (a few), *Zephyrus quercus*, *Amphidasyus strataria*, and *Psilura monacha*. The party remained out the best part of the day, and returned by the Beaulieu Road, picking up some more *Scodionia belgiaria* on Whitemoor. Mr. C. B. Smith had previously returned to dinner, and, in the afternoon, he and Mr. L. J. Tremayne sauntered down to the "Bombyx" Heath, and took several *B. rubi*, and, coming back, took a fine specimen of *Eupithecia togata* from a fence. Meanwhile, Messrs. Jennings and W. H. Smith had spent the day at Rhinefield, and taken eleven specimens of *Macroglossa fuciformis*. They also found several species of large *Syrphidae* in numbers at the rhododendron blossoms. Amongst them were *Seryconyia borealis*, *Criorrhina oxyacanthæ*, *Volucella bombylans*, and var. *plumata*, and *Myiatropa florea*. *S. borealis* much resembles a wasp, both in its markings and in its manner of flight, and, when caught, produces a loud humming noise by the vibration of the halteres, which resembles, in miniature, the crying of a child. A single specimen of *Conops vesicularis* was seen, but unfortunately escaped. On the way home, Mr. W. H. Smith took *Metrocampa margaritaria*, *Geometra vernaria*, and a larva of *Catocala sponsa*, beaten from an oak close to Clay Hill. The larvæ of *Diloba caeruleocephala* and *Nola cucullatella* were abundant on the banks of the Lymington River, and, in Hurst Wood, Mr. Jennings saw a ♀ of *Dioctria oelandica*, one of the predatory Diptera, with its prey in its jaws. Beechen Lane and Whitemoor were the scenes of the evening work. Sugar was as useless as on the previous night, and dusking only slightly improved. On Monday, most of the party started for Matley Bog, *viâ* Whitemoor. For Lepidoptera, this was the best day of the trip. The alder swamps in Matley Bog yielded *Hydrelia uncula*, *Eupisteria oblitterata*, *Hypsipetes trifasciata*, and *Erastria fasciana*, while *Aspilates strigillaria* occurred not uncommonly on the heaths, and *Drepana falcata* was found among the birch. Mr. Jennings met with the only good Weevil taken during the trip, a specimen of *Erirrhinus bimaculatus*, also the best species of Diptera taken, *vi. z.*, a ♂ of *Spilomyia speciosa*, boxed

from the side of the brook, running through Matley Bog. This gentleman also obtained a ♀ of *Merodon equestris*, which species also Mr. Nicholson had taken at flowers in the "Lynwood" garden. This is an introduced species, having been brought to England in bulbs, in which the larvæ live. It is now well established in this country. The party returned early, and after a hearty tea, caught the 7 o'clock train back to town. Mr. Jennings reports the following species, other than Lepidoptera, taken during the trip, in addition to those already mentioned:—**COLEOPHORA**.—**GEODEPHAGA**:—*Calosoma inquisitor* (two beaten from oak, and one each from hazel, beech, and hawthorn); *Abar striola* (one, under log on heath); *Harpalus rubripes* (ditto); *Dromius 4-maculatus*: four species each of *Pterostichus*, *Notiophilus*, *Harpalus*, and *Calathus*, not yet named. **BRACHELYTRA**:—*Creophilus macillosus* (under a dead rabbit on Whitemoor). **NECROPHAGA**:—*Silpha 4-punctata* (beaten commonly from oaks); *S. rugosa*; *S. sinuata* (several obtained from the before-mentioned dead rabbit); *Saprinus* (two unnamed species from the same source). **LAMELLICORNIA**:—*Geotrupes vernalis* (on Whitemoor); *Trox sabulosus* (under an old rag at a spot where there had evidently been a gipsy encampment); *Melolontha vulgaris* (several beaten from oaks); *Phyllopertha horticola* (four in various situations); *Lucanus cervus* (several). **ELATERIDÆ**:—*Campylus linearis* (out of hawthorn); *Corymbites holosericeus* (common on oaks). **MALACODERMATA**:—*Dolichosoma nobile* (from aspen). **LONGICORNIA**:—*Anoploclera servituta* (on a wall); *Rhagium bifasciatum*, *R. inquisitor* (at sugar in Jones' enclosure); *Clytus arietis* (two on dead wood); *Trox meridianus* (netted, flying near the Lymington River at Rhinefields); *Strangalia nigra* (three from Matley Bog). **PHYTOPHAGA**:—*Clythra quadripunctata* (taken by Mr. Bacot at Denny); *Cryptocephalus lineola* (from heather on Whitemoor); *Adinomia capreae* (several); *Phytodecta riminalis* (several). **HETEROMERA**:—*Lagria hirta* (out of an oak in Hurst Wood). **RHYNCHOPHORA**:—*Atelabus curculionides* (two out of oaks); *Rhynchites pubescens* (several out of oaks); *Otiorrhynchus picipes* (several from hawthorn); *Strophosomus coryli* (common on anything but hazel); *Hylobius abietis* (three); *Erirhinus tortricæ* (two from aspen); *E. maculatus* (several from aspen); *Balaninus glandium* (beaten from oak). **DIPTERA**:—*Bombylus major* (in a most dilapidated condition, having half of both wings gone, and very ragged pubescence). **HEMIPTERA-HETEROPTERA**:—*Acanthosoma* (three specimens of a species beaten from hawthorn), a yellow species was common on oaks, and a fine green Capsid was beaten from hawthorn at Rhinefields. **HYMENOPTERA**:—*Tenthredinidæ*: *Tenthredo maculata* (taken by Mr. Harvey, near Brockenhurst).—
LAWRENCE J. TREMAYNE, Buckley Road, Brondesbury.

SOCIETIES.

CITY OF LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.—June 1st, 1897.—**TIRESIAS SERRA BRED**.—Mr. Heasler exhibited *Tiresias serra*, bred from larva obtained under bark at Richmond, last January. This species appeared to pupate in the last larval skin. **NOTES ON BREEDING ARCTIA CAIA**.—Mr. Bate exhibited four female *Arctia caia*, the offspring of a pair exhibited with them, which were the second brood of 1896, emerging in September last. He said:

"These four 'forwards' fed through the winter indoors, pupated in February, 1897, and emerged after exactly 50 days in the pupal state. They were generally dark, and had more or less black fringe to hind-wings." VARIATION OF LARVA OF SATURNIA CARPINI.—Mr. Bate also exhibited two larvæ of *Saturnia paronia-minor*, one in the 2nd, and one in the 3rd skin. The first was black, with orange tubercles; the second was green, with interesting club-shaped hairs on the thoracic and last two abdominal segments. NOTES ON MELANIPPE MONTANATA.—Mr. Prout exhibited a short bred series of *Melanippe montanata*, from a ♀ captured in Epping Forest. Eight of these fed up and emerged in the autumn; two hybernated in their final skin; also two bred specimens of the var. *shetlandica*, Weir, the larvæ of which hybernated in the last skin but one; also a specimen of the var. *lapponica*, Stgr., from North Finland. Mr. Tutt, in his *British Moths*, p. 274, appears to unite these two varieties, but they seem to differ considerably (as Herr August Hoffinan has remarked), in that the former is darker and more ochreous, the latter much paler than the type form. LIVING LARVÆ.—Mr. Bacot: Larvæ of *Acidalia marginipunctata* and *A. inornata*, *Porthesia chrysorrhoea* and *P. similis*, *Polia xanthomista* var. *nigrocincta*, *Catocala fraxini* and *C. nupta*; also newly-hatched larvæ of *Eurranthis plumistraria* and *Hemerophila abruptaria*; also larvæ of *Tephrosia crepuscularia* (*biundularia*) in 1st stage. Mr. Bacot read the following notes: "Although the eggs of *E. plumistraria* and *H. abruptaria* are very similar, with respect to certain strongly-marked characters, the larvæ are entirely different. The young larvæ of *E. plumistraria* are superficially similar to those of *T. crepuscularia*. Differences of detail are, however, apparent with the microscope. The coloration and characters of newly-hatched larvæ of *Selenia* and *Nyssia* are also similar to those of *Tephrosia*, and it seems probable that *Selenia* is really much nearer to *Tephrosia* than to *Eugonia*, with which it is usually placed."

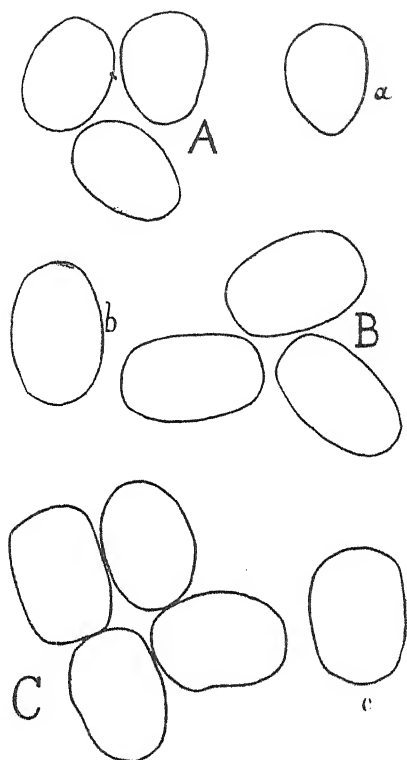
June 15th, 1897.—BOARMIA CONSORTARIA IN THE NEW FOREST.—Mr. Nicholson exhibited a specimen of *Boarmia consortaria*, taken in the New Forest on Whit Monday last, and some of the eggs laid by it. MALFORMATION OF PIERIS BRASSICÆ.—Mr. Bate: One ♂ and five ♀ *Pieris brassicæ*, bred from larvæ found last autumn. Two females showed slight malformation, due to the tightness of the silk sling which the larva spun, and which caused a deep indentation in the pupa. With reference to this exhibit, Mr. Nicholson said that he had always bred *Gonepteryx rhamni* with the mark of the pupa-case (silken girth?—ED.) across its wings, though not so badly as in these specimens. ABERRATIONS OF COREMIA FERRUGATA, ETC.—Mr. Bayne: *Coremia ferrugata* (1) with the twin spot obsolete, from Epping; (2) with the twin spot strongly developed, from the New Forest; (3) with the red lighter than usual, from Aylesbury; (4) with the band very dark, from Aylesbury. He also exhibited red-banded *C. unidentaria*, from Epping; *Melanippe galiata*, one with black solid band, from Aylesbury; *Cidaria corylata*, from Epping, one suffused with olive; *Aglais urticae*, approaching var. *polaris*, from Hoddesdon, 1897; *Nola cucullatella*, with the melanic var.; *Thyatira batis*, one from Epping, without the pink colour in the spots, though very fresh. OXSHOTT IN JUNE.—Mr. Bate had been at Oxshott on Monday last, and had found *Bupalus piniaria*, a few *Brenthis selene*, *Polyommatus*

icarus, and many *Adela degerella*. He had also found a swarm of bees hanging to one of the lower boughs of a pine tree. The bough being cut in half, the bees vanished, but they presently returned, and Mr. Bate then captured them, bough and all. *HYDRILLA PALUSTRIS* AT WICKEN.—Mr. Clark reported that *Hydrilla palustris* was taken at Wicken Fen on June 5th.

NONPAREIL ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.—JUNE 17th, 1897.—Exhibits: Mr. Craft, Jun., showed various species from Winchester, including a very fine and varied series of *Nemophila plantaginis*, along with *Xylophasia subulstris*, *Asphalia fluctuosa*, *Eurymene dolobraria*, *Anaitis plagiata* and *L. adustata*: also some fine healthy larvæ of *Eriogaster lanestris*. *Macroglossa fuciformis*, from the New Forest, was exhibited by Mr. Norman, and also a variable series of *Smerinthus tiliae*, bred from Dalston and Penge larvæ. One of these had the triangular bar on the superior wing very well marked, whilst on the other it was entirely absent. Larvæ, both living and preserved, of *Clisiocampa castrensis*, from Benfleet, were shown by Mr. Gurney, and created general interest. The finest exhibit of the evening was that of Mr. Hockett, who showed a magnificent series of *Angerona prunaria*, bred from Chingford larvæ, one dark one especially being very much admired. A slightly varied series (bred) of *Abraæas grossulariata*, *Polyommatus icarus* from Croydon, and a specimen of *S. tiliae*, taken in the heart of London, was Mr. Samson's exhibit. A curious cocoon, formed of pieces of beetle wings, found near a pond at Hendon, was shown by Mr. Smith. Although nothing definite could be said as to what species it belonged, it was the general opinion that it was the cocoon of some beetle. Mr. Lusby exhibited a series of *Arctia villica*, bred from Willesden larvæ; also living larvæ of *Saturnia carpinii*, bred from the egg.

COMMITTEE FOR PROTECTION OF INSECTS IN DANGER OF EXTERMINATION.

—At a meeting of the committee, held on June 2nd, it was resolved that the following species of Lepidoptera, being local species in danger of extermination, be more particularly recommended for protection, in accordance with the final paragraph of the Memorandum of Association:—*Papilio machaon*, L., *Leucophasia sinapis*, L., *Aporia crataegi*, L., *Melitaea athalia*, Esp., *Melitaea cinxia*, L., *Apatura iris*, L., *Limenitis sibylla*, L., *Thecla pruni*, L., *Egyæna arion*, L., *Cartrocephalus paniscus*, Fab., *Thymelicus actæon*, Esp., *Trochilium scoliaeforme*, Hüb., *Zygæna meliloti*, Esp., *Zygæna eridania*, Hoch., *Nola strigula*, Schiff., *Nola centonalis*, Hüb., *Nola albulalis*, Hüb., *Eutopia cribrum*, L., *Portheia chrysorrhoea*, L., *Clisiocampa castrensis*, L., *Drepama sicula*, Schiff., *Diphthera orion*, Esp., *Acosmetia caliginosa*, Hüb., *Dianthoeia irregularis*, Hufn., *Plusia orichalcea*, Fab., *Epione respertaria*, L., *Fidonia conspurcata*, Schiff., *Scoria dealbata*, L., *Cidaria reticulata*, Fab., *Lithostege griseata*, Schiff., *Agrotera nemoralis*, Scop., *Pterophorus rhododactylus*, Schiff. Further resolved, that a copy of this list be forwarded to every society co-operating with this committee, with an explanation (where necessary) that the committee does not desire to hamper any local society, in any more stringent action proposed to be taken by them, for the protection of local species. Also resolved, that each such society be invited to delegate one of its members, who shall be received as a member of this committee.—CHAS. G. BARRETT, F.E.S., Hon. Sec., 39, Linden Grove, Nunhead.



OUTLINES OF OVA OF *TEPHROSIA CREPUSCULARIA* AND *T. HISTORTATA*

- A. Ova of *T. crepuscularia*.
- B. Ova of *T. histortata*.
- C. Ova of *T. histortata*.

- a. Typical shape of ova of a batch.
- b. Typical shape of ova of b batch.
- c. Typical shape of ova of c batch.

The Entomologist's Record AND JOURNAL OF VARIATION.

VOL. IX. No. 9.

SEPTEMBER 15TH, 1897.

The ova of *Tephrosia bistortata* (*crepuscularia*) and *T. crepuscularia* (*biundularia*) (Illustrated by Plate).

By J. W. TUTT, F.E.S.

Hellins described the egg of *T. crepuscularia* (*biundularia*) as follows:—"The egg is oblong, cylindrical and full, more conical at one end than the other; the shell of dull appearance, without any gloss, but also without any reticulation or granulation, except just in the centre of the fuller end, where there is a small circular patch of oval reticulation; the colour of the egg is of a light bright green" (*E.M.M.*, vol. xiv., p. 236).

We are indebted to Mr. Bacot and Dr. Ridg for another move in our knowledge of these two species. The difficulty of comparing the eggs side by side, owing to the fact that they emerge at different seasons of the year, has been met by these gentlemen, by slightly forcing pupæ of *T. crepuscularia* (*biundularia*) so as to obtain the emergence of the imagines at the same time as the ordinary emergence of *T. bistortata*. Not only has this been done, but reciprocal pairings between the two species have been obtained, and the eggs have proved fertile. Mr. Bacot was kind enough to send me three lots of eggs. (1) *T. bistortata* eggs, the result of a pairing of two typical insects of this species on Feb. 26th (Pl. vi., fig. B). (2) *T. bistortata* eggs, fertilised by a male *T. crepuscularia* on Feb. 28th (Pl. vi., fig. C). (3) *T. crepuscularia* eggs, the result of a pairing of two typical specimens of this species on March 3rd (Pl. vi., fig. A). These hatched, respectively, on March 25th (27 days as ova), March 30th (30 days as ova), April 1st (28 days as ova), but no stress can be laid on this period, as the eggs were subjected to quite abnormal and varying conditions of temperature.

On March 10th, Mr. Baty mounted for me, side by side, several eggs belonging to the first and third batches; the eggs were then 12 and 7 days old respectively. The differences between the eggs, as seen under a low power (only magnifying 70 diameters), are sufficient to put at rest any possibility of their belonging to the same species. The eggs belonging to the two sets were quite easily separable, both by Mr. Baty and myself.

Egg of T. bistortata (12 days old).—The egg of *T. bistortata* is, to the naked eye, of a delicate pale pea-green colour. It is somewhat cylindrical in shape, with rounded ends, and although the eggs are slightly variable in size, and somewhat variable in shape, due to certain indentations, evidently caused by external pressure at the

time of laying, such abnormal depressions are very clearly marked, and the general contour of the eggs is maintained. The characteristic oval depression, seen in the upper surface of most Geometrid eggs, is rather well marked, and moderately large. The surface of the egg is smooth, finely pitted at the micropylar end. The oval depression is placed well towards the micropylar end. There are faint traces of irregular ribbing towards the curved edge of the same end. The shell is very transparent, and the egg-contents also inclined to be so.

Egg of T. crepuscularia (7 days old).—The egg of *T. crepuscularia* is, to the naked eye, of a pale pea-green tint with a suspicion of blue in it. It is oval in shape (*i.e.*, of the shape of a hen's egg). The eggs are peculiarly constant in size, with an oval depression on the side nearly midway between the micropyle and its nadir. The micropylar area is covered with a distinct pitting, although the shape of the micropylar cells are difficult to make out. The micropylar area occupies a considerable portion (about two-thirds) of the broad end. There is no trace whatever of ribbing. The egg-shell is not transparent.

Comparison of the egg of T. bistortata with that of T. crepuscularia.—The comparison of these eggs is a very easy matter, for they differ in several particulars. As they rest side by side under the microscope, the larger size of the egg of *T. bistortata* is very evident. It has about double the cubical contents of that of *T. crepuscularia*. The colour of the egg of *T. bistortata* is now (under the microscope with a good light) of a pale pearly whitish green, that of *T. crepuscularia* of a dull yellow hue, in which there is scarcely a trace of green. This is particularly interesting, considering how nearly of the same tint they appear to the naked eye. In shape, too, the two sets of eggs are very different. The shape of the egg of *T. bistortata* is not unlike the long cylindrical eggs, with almost equal rounded ends, so characteristic of many Geometers; that of *T. crepuscularia* resembles somewhat a hen's egg in shape, with one end much fuller than the other. The outline sketches (drawn to scale) from the two lots of eggs, as they lay side by side in the field of the microscope, will give a better notion of the difference in shape and size than any amount of description will do. The egg-shell of both species is very smooth, but that of *T. bistortata* is shiny and somewhat transparent, whilst that of *T. crepuscularia* is dull and opaque. The depression on the upper side of the eggs is placed near the micropylar end in *T. bistortata*; that of *T. crepuscularia* is placed near the centre of the upper surface. The shell of *T. bistortata* is irregularly wrinkled longitudinally; no such wrinkles are observable in the egg of *T. crepuscularia*. The micropylar area of *T. bistortata* is a marked depression, that of *T. crepuscularia* is spread over the convex surface of the broad end of the egg. It is most interesting to have had the eggs of the two species side by side for examination. I am quite open (and so is my friend Mr. Baty, who has made the microscopical examination with me) to separate normal eggs of these species from each other.

I strongly suspect that the difference of colour—the more yellowish tint of *T. crepuscularia*—in the early stage, is due to a real difference in the embryonic development of the egg, and not to the difference of age, for the *T. crepuscularia* eggs were five days newer than those of

T. bistortata, and one would have imagined, had the difference of colour been due to age, that the eggs of *T. crepuscularia* would have proved the older. I observed also in the eggs (10 days old) of *T. bistortata*, which had been fertilised by a ♂ *T. biundularia*, that the colour was distinctly more yellowish than in the eggs of *T. bistortata*, which were two days older. The difference here referred to is not the assumption of the yellowish-green tint, which all the eggs take on in a later period of their development, and which is distinctly visible to the naked eye just previous to the final colour change that precedes hatching.

These notes were written before Dr. Ridings's note (*ante*, pp. 149-150), but at the time that I exhibited these eggs, and made the remarks printed, *ante*, pp. 127-128, I had not learned from Mr. Bacot the age of the eggs. I print this with some diffidence, in the face of Dr. Ridings's note, but have no doubt that further observations will make clear the points of difference.

Notes on *Charaxes jasius*: its life-history, protective resemblance, etc., with some observations on moulting and pupation.

By T. A. CHAPMAN, M.D., F.E.S.

(Concluded from p. 194.)

PHYSIOLOGICAL NOTES.—When the larva moults—I had several which changed from the penultimate to the last skin—the head of the larva retreats from the effete head to the pro-thoracic segment, leaving only the mouth parts within the old head; this is a fact easily observed in many species of larvæ, but it struck me here as curious that the four horns or spines of the new head were not directed backwards, but laterally two to either side, under the skin of the pro-thoracic segment.

In many Noctuid (and other) larvæ with transparent heads, it is easily seen, at the period of moult, that the old head is not entirely filled by the jaws, etc., of the new head, but that the old head is largely occupied by fluid, which bathes the new skin beneath the old one. At this stage the head has really moulted, being chiefly within the pro-thorax. How is the excess of fluid within the old head removed just before the actual casting of the skin—is it swallowed by the larva, or does it desiccate? It can hardly be swallowed, as the mouth is at this period occupied by the effete œsophageal membrane. This fluid contains some chitinous matter in solution, and the dampness of the newly-changed larva dries up into a superficial layer of chitinous material. The cast skin also, which is damp on being first cast, can, during a brief period after, to be measured by seconds, be extended and displayed; but if once dried in its shrivelled state, I have always failed by any process to so soften it again as to make it capable of being extended. Some larvæ leave their skins partially extended by all the prolegs retaining their hold of a silken carpet. To return, however, to *C. jasius*, it may be noted that, as with many other species, in the larval moults, the head is cast entire, but at the pupal moult it splits up. At a larval moult

the larva eats the cast skin, except the head, but I think it is the case that it does not specially eat up the leaf with the silken carpet on which it has rested, as our *Ceruræ* invariably do when possible.

I had the good fortune to observe one specimen throwing off its larval skin and assuming the pupal state; and whilst I saw several things that are now well known and understood, there was one circumstance I noted that was quite new to me, as I had never seen it before, nor have I read of it. The pad of silk, to which the larva suspends itself, is made in a few hours; the actual pad is made by the larva withdrawing its head from the surface, and so making a free loop of silk, longer than is necessary to reach to the point of surface to which it returns, and the repetition of this process gradually forms the pad; it is always so placed that the larva shall swing clear of all surrounding objects, and never, as many *Vanessid* larvæ will, so that the pupa can touch a vertical surface. It has a certain amount of surrounding spinning, usually apparently with no other object than as standing room for the larva whilst spinning the pad, but in one instance, when the suspension was beneath a leaf, certainly tending to prevent the leaf falling off by spinning the petiole to the twig. I never happened to see how the larva made sure of where the pad was when it secured itself thereto with its anal claspers, and it must fall to the suspended position immediately, as I never saw one with its claspers in position on the pad and still holding by the ventral pro-legs, a position held for many hours by most *Vanessid* larvæ I have noticed. As soon as suspended, it curls itself up into a ring, with the mouth to the under surface of the 8th abdominal segment; this position is maintained for two or three days (in my room, possibly less when at large in a warm exposure). When ready to change, the coloured anal appendages are visible through the larval skin. The first actual steps towards the moult are very slight and slow in progress; a certain amount of movement is visible by depression or contraction of segments, somewhat rhythmically, and apparently, as all these movements are, vermicular, that is, passing from segment to segment. During several hours, however, the results are slight, just as the movements have been: they consist, so far as can be seen, in a few white lines under the first and second, and dorsally on the terminal, abdominal segments, as well as a few in front of the second segment. These indicate places where slight folds have occurred in the effete skin, and probably indicate that the operations of the past few hours have been more important than appears, by making the skin everywhere free from the pupal skin beneath, breaking down any remaining cellular attachments, and leaving nothing between the old and new skin but a little fluid. By this time the head of the larva is opposite the sixth abdominal segment, and not quite touching it, so that only a little straightening has taken place. More active (apparently) movements now occur, strictly vermicular in character, that is commencing at the anal segment which contracts, and passing forward to segment after segment; after five or ten minutes the larva is L-shaped, that is, the thoracic segments are now horizontal, and the head far removed from the front of the abdominal segments. It is now obvious that the 2nd and 3rd thoracic segments are enlarged, a change that had already progressed during the first stage; the first thoracic is small throughout,

Additional slight folds of effete skin occur across the dorsum of the abdominal segments. The third stage, if not of greater activity, at least of very much more rapid progress, is entered upon. The skin of the abdominal dorsum slides backwards, and accumulates at the anal extremity, ventrally, the suspensory processes of the pupa, which are very large and conspicuous in this pupa, are easily seen through the delicate skin to hook into a fold of the skin of the last segment, or rather into the fold formed by the incision with the next segment, and the skin of the ventral surface accumulates in front of this. It is also tolerably evident, though the folds of larval skin are now thick enough to rather obscure it, that the cremastral process is thrown backwards at each vermicular movement, acting from the suspensory processes as centres of rotation, so as to push the successive folds of dorsal skin, as formed, down between it and the suspensory processes. The succession, or rather concurrence, of events is now very rapid; one notes the white points formed at the spiracles by the dragging out of tracheal linings, quickly extending into a continuous line, and one notes especially such a lining drawn out between the 2nd and 3rd thoracic segments, where the imago has, but the larva has not, a spiracle. Suddenly one sees that the larval skin is ruptured down the centre of the thorax, and soon that the head is split in half, with the clypeus in a separate piece, which follows the mouth parts. Quickly the skin passes towards the tail, the cremaster has pushed all the dorsalskin below it and appears, through the dorsal slit, and at the second push through, it seizes the pad of silk, and then the movements of the pupa push it off the suspensory processes, and, all weight being taken off it, and receiving some upward pushes, the crochets of the anal pro-legs also are loosened from the pad of silk, and the skin is free and falls. This pupa, chiefly perhaps from its large size, but also from the colouring of the suspensory processes, renders the part the latter play in the casting of the larval skin, very easy to observe, a function which was very carefully demonstrated a number of years ago by Dr. Osborne. The casting of a tracheal lining from the 2nd thoracic spiracle at pupation I do not remember to have observed before, but inferred that such occurred, since I had seen it many years ago in numerous larval moultings; first in the large silkworms (*Autheraea yama-mai*, L.), and had also demonstrated the existence of this spiracle in the imagines. The pupa is still of considerable length, and comparatively narrow, and the wings and appendages are short, only reaching to the middle of the 3rd abdominal segment; all the abdominal segments also are rounded with deep incisions. Vermicular movement continues, with the result of gradually bringing the pupa into its short, squat form, with very dwindled terminal segments. During this process the wings and appendages nearly double in length, and the vermicular movements seem to cause this result by a process of forcing the fluids from the diminishing to the increasing parts. It was during this stage that I noticed the phenomenon that I have alluded to as entirely new to me. At the commencement of this stage the spiracles (abdominal) are wide, oval depressions, with apparently the spiracle proper of a brownish colour at the bottom, and during the process they become narrower, till they are, in the mature pupa, very narrow lines, with questionably any actual lumen. I did not catch this detail immediately, but within a minute or two

of the skin being cast, I noticed what could not be better described than by saying that these spiracles winked at me. The brown-coloured portion was now at the bottom of an oval slit, not much wider at the surface than below, but just within the outer opening there descended from above, and hid the brown base, a pale green diaphragm, exactly like an eyelid, and then rose again. I examined this process through a strong pocket lens, and when I took to timing it, found it occurred once every three seconds, the opening being now the shortest part of the sequence, and lasting half a second. I could not be sure that they were simultaneous with the vermicular movements, but they continued till the spiracular openings became too narrow to see them distinctly. It may be an entirely erroneous conclusion, but I could not resist the idea that these were valvular arrangements, associated with the pumping process necessary to the expansion of the appendages. They may be merely a development occurring (rapidly like that of wings) for the occlusion, more or less complete, of the spiracles during the pupal state; but then, are the spiracles quite occluded during the pupal state? I doubt it; and secondly, why the winking? A gradual development would be all that was necessary, as with the wings, which do not flap as they increase in size. This is obviously a matter that wants following up. I ought, perhaps, in order to be more clear, to say that the observation was, of course, made as the pupa hung in its natural inverted position; the descent of the eyelid was therefore from the posterior margin of the spiracle, the final narrow slit being parallel with the lines of incision, or nearly so. I was unable to make any observation on the spiracle of the first thoracic segment.

When the pupa has assumed its permanent squat rounded form, it is still very soft and delicate, and for several days, if touched or disturbed, it is capable of movement, which affects the incisions on either side of the 5th and 6th abdominal segments, and seems also to produce flexion of the pupal integument; but later, say a week after moulting, the pupa appears to be solid and incapable of movement, but considerable irritation produces a trifling amount of movement, not of flexion, but of retraction, so that these segments (5th and 6th abdominal) are in this species both free. For some hours before emergence they are fully extended, as they never are during pupal quiescence, by the inflation that is so general a phenomenon in insects at emergence from the pupa.

My pupæ, brought to England, continued in the pupal state about five weeks, and of this period, the time necessary to the development of the imaginal colours, appeared to me exceedingly short. After some increase in opacity of the ordinary green tint, the brown colour of the margin of the fore-wings became evident and fully developed as to colour, whilst the rest of the wing was still green, then the black colour of the mass of the wing appeared. From the first trace of brown colour to emergence, only 38 to 48 hours elapsed, and from its full development, before any black appeared, to emergence, less than 30 hours; in one case, on a warm day, less (I do not know quite how much less) than 24 hours. A high temperature would doubtless diminish even these periods.

The Rhopalocera found in the Basses-Alpes (Digne) in April.

By J. W. TUTT, F.E.S.

Three of our most energetic students and collectors of European Rhopalocera—Messrs. A. H. Jones, Lemann and W. E. Nicholson—have at various times visited Digne, in the Basses-Alpes, recorded (*P.M.M.*, vol. xxvi., pp. 280-283; vol. xxviii., pp. 270-275) its insect fauna, so far as the species that occur in the summer months are concerned, and thrown out hints as to the possibilities of the locality in early spring. Dr. Chapman and myself arranged to meet there this spring, and spend a few days, during Easter, exploring its recesses. I was joined by Mr. Stanley Edwards, and on April 16th we found Dr. Chapman awaiting us there. The doctor had arrived on April 13th, and he stayed on until April 29th, so that the result of this fortnight's work may be taken to represent a very fair sample of the insects that can be taken at Digne during this period of the year.

We were much impressed by the odours of the town. One of the most evil-smelling streets was called the Rue de la Mère de Dieu, and this led into a dirty court, known as the Place de Paradis. Whether the Digne notion of heaven was idealised in these places we know not. However, we spent a very enjoyable time, captured a fair number of specimens; yet we were, after all, too late for fine *Erebia epistygne*, which appears to be at its best during the last week of March, and there can be no doubt that, as a mere matter of obtaining specimens generally, we were a week or fortnight too early. True, we got a large number of species, but, with very few exceptions, they were not fully out, and Dr. Chapman's bag on his last day (April 29th) alone equalled that of the combined nets on any other two days spent there, and insects that had previously been scarce were by this time in considerable abundance.

Digne lies at an elevation of 2,000 feet, a factor that all travelled entomologists will understand. We directed our excursions to the hills around the town, and the top of one of these hills from 3,000-3,500 feet was usually the objective of each day's excursion. At the elevation at which we collected then, the vegetation bore a very close resemblance, in point of development, to that of a wooded district in the south of England in late April, and one was rather astonished to find so many diurnals abroad among such comparatively bare surroundings. Still, in spite of the vegetation being so little in advance of that in Britain, the days were intensely hot just before and after noon, and Dr. Chapman found an *Adiantum* growing on the rocks at 3,000 feet elevation, which says much for the absence of severe winter frosts even at this elevation. The butterflies obtained were numerous and interesting. Perhaps they had better be dealt with *seriatim*.

HESPERIDES.—*Spilothyrus alceae*, *Syrichthus alceus*, *S. sao*.—Two or three specimens of each of these species were obtained; evidently they were just appearing. *Thanaos tages*, *Syrichthus malvae*, both well out, the former very abundant, and differing, so far as I observe, in no wise from British examples.

PAPILIONIDES.—LYCENIDÆ.—*Callophrys rubi*.—This was probably the most abundant species observed. It swarmed about the *Prunus* flowers, and flew about everywhere over the broom, on which the eggs were possibly laid; but the larva is not particular in its choice. *Chrysophanus doritis*.—Just appearing, the dark males with

a row of very distinct blue spots parallel to the hind margins of the hind-wings; the female very bright and resembling *C. phlaeas* in colour. It is regularly double-brooded in southern France. *C. phlaeas*.—Also just appearing. The females very large and brightly coloured. *Polyommatus baton*.—Abundant, generally distributed, and showing marked sexual dimorphism. The females are somewhat variable, some being much more plentifully besprinkled with blue scales than others. Frey says that this species is found up to 7,000 feet in Switzerland (in the Albula Pass). *P. astrarche*.—Just coming out. The females large, and both sexes brightly marked with marginal orange spots. Frey says that "the early brood of Swiss specimens bears, on the upper side, traces only of the reddish-yellow or peacock eyes, which appear larger and more distinctly on all four wings in the summer brood," and he further emphasises this statement by saying that "in the Alps of Wallis, Berne and the Grisons, common, in the form of the spring brood, with gradual disappearance of all red spots on the upper sides of the males, whilst the females still preserve distinct peacock-eyes. The brood is in this case single." In Britain, there is but little difference in the orange spots, the females of both broods having the spots much better marked than in the males. In Piedmont, the Tyrol and Dauphiné Alps, I have found that the males of the second brood have the least trace of these spots, sometimes entirely absent, and the brightly-marked spring specimens from Digne bear out this conclusion. *P. icarus*.—Just appearing. Males only observed. A fair number of the specimens captured were *ab. icarinus*. *P. hylas*.—Just appearing; specimens on the 28th and 29th of April. *L. bellargus*.—Two or three males only seen; evidently newly emerged. No females were observed. Frey notices that Alpine females are nearly always uniformly brown, or only very slightly suffused with very pale blue. *Cyaniris argiolus*.—A few specimens, mostly torn, about the *Prunus* blossoms. Frey says that the vertical distribution of this species is not great, and that is my experience. *Nomiades cyllarus*.—Abundant; a beautiful insect with skyblue bases to the undersides of all four wings. Frey says that the Swiss specimens are "variable in size, shape of wings, ocellated spots and metallic bluish-green basal powderings. The latter are greener in specimens from Wallis, whose underside is thereby brightened up when compared with southern specimens." The variability in size is very great at Digne, and there is some difference in the brilliance of the metallic powderings, which, however, are blue rather than green. The males are given to wandering, flying about bushes, and being more conspicuous, appear commoner, but the females are not uncommon on the borders of the meadows. The doctor was most insistent that the females were scarce, according to Kane, probably because he found a very fair number of this sex. *N. melanops*.—This purely southern species was abundant, perhaps the most abundant blue. It was very generally distributed. *N. sebrus*.—Just emerging on April 29th, as also was *Cupido minima*, a specimen or two of each species only being taken.

LEMONIIDÆ.—*Nemeobius lucina*.—Generally distributed, and in one wood not uncommon. The insect had evidently been on the wing some days. The specimens are bright and very strongly marked. Frey gives "sorrel," as well as *Primula*, for the food-plant. We got specimens where the cowslip was abundant.

PAPILIONIDÆ.—*Papilio podalirius*.—Well out, and very generally distributed. The specimens appear somewhat pale. *P. machaon*.—Also well out, but rarely seen, except when flying round the summits of the lower mountains, to which we climbed. In these positions they were abundant; in some cases *P. podalirius* joined them in their breezy gambols. I have often noticed the habit in *P. machaon* before, and Frey says that *P. podalirius* haunts mountain tops at “not above 3,000 feet.” The undersides of *P. machaon*, decidedly pale. *Parnassius apollo*. One larva only on *Sedum*, more than one-third grown already (April 20th), good progress for an insect that hibernates as an egg. *Thais medesicaste*.—This species was well out by April 17th, on which date at least 37 were captured by three collectors from Les Dourbes—25 by one, and 8 and 4 respectively by two others. We did not attempt to work the favourite ground of these collectors, nor were we particularly keen on this species, being more concerned to discover the number of species that were out. One thing is quite certain, and that is, that the species has been, and is now, persecuted to such an extent that it is comparatively rare, and although the nature of the ground will prevent its actual extermination, it must soon get perilously near it. A conversation with the Coulets drew out the facts that they posted the insects which they caught, unset, on the day of capture, and that the species, which used to occur in the greatest abundance, was now getting comparatively rare. We understood that only one specimen of the ab. *honoratii* was captured last year, but 16 were taken during the previous season. We heard of no *honoratii* being captured during our visit. We picked up odd specimens of the type over a considerable area of ground during our stay. When the insect is no longer sufficiently abundant to pay these collectors to come from Les Dourbes, a walk of six miles, it may recover again for a brief period at least.

PIERIDÆ.—*Aporia crataegi*.—Larvæ on *Crataegus*, from about half-an-inch to full-grown and hung up for pupation; certainly not very abundant, although not rare. *Pieris brassicae*.—Just coming out. *P. rapae* and *P. napi*.—Both well out and common. *P. daphidice* var. *bellidice*.—The spring brood was going over already; most of the specimens captured were worn, a few, however, in fine condition. There seems to be considerable difference between the specimens captured and those I have taken of the second brood, in many localities. The distribution of this insect seems to suggest that, except under exceptional conditions, this is purely a South European species. Frey says that, “even in the latitude of Geneva, *daphidice* becomes scarce, and in the remainder of Switzerland occurs very rarely, or only as an occasional solitary example.” *Anthocharis belia*.—Rare, or not fully out. We saw very few examples, possibly not more than half-a-dozen altogether. They were of the usual South European form, possibly a little smaller than those Dr. Chapman obtained at Cannes, and from which he already had pupæ of the second brood, var. *ausonia*. Frey thinks that the var. *simplonia*, which is widely distributed in Switzerland (and also occurs in Piedmont and ? Tyrol) in June and July, from 3,000–5,000 feet in Simplon, Wallis, Laquinthal, Visp, Ryffelberg, Arollathal, is the old type which has resolved itself into the forms of *belia* and *ausonia*. *A. tagis* var. *bellezina*.—This species, which has made Les Dourbes famous entomologically,

occurred very sparingly at about 3,000 feet elevation. The species most certainly was not fully out. *Euchloë cardamines*.—Well out and abundant; variable in size, extending from ab. *major*, Tutt, to ab. *turritis*, Och. The underside marblings, yellower than those of British examples, and with the paler markings forming a distinct white band on the underside of the hind-wings, parallel to the hind margin. *Leucophasia sinapis*.—Abundant and very generally distributed in the district, with darker shading on the undersides of the hind-wings than in British specimens, and probably the true ab. *lathyri*. On the upper side, quite indistinguishable, in both sexes, from British specimens. Kane's description of ab. *lathyri* (*Eur. Butts.*, p. 15) is distinctly a duplication of the description of *L. duponcheli*. Frey's notes lead one to suppose that in Switzerland the two broods are very similar to our British examples. *L. duponcheli*.—Moderately abundant, haunting precisely the same ground and occurring with *L. sinapis*, some of the latter, in their dark underside shading, running it very closely. Were it not for the differences between the females and the ova, I should be strongly inclined to suspect it as being only a well-marked form of *L. sinapis*, but the marked sexual dimorphism of the latter is not followed in *L. duponcheli*, in which the sexes are somewhat similar, and the ova are differently sculptured. It is, however, interesting to stand in a gully, by the side of a brawling streamlet, and capture these two species, one after the other, and not be able to tell, until the underside is examined, which species you have. On one occasion I observed a male *Leucophasia* attempting to pair with a female; as they appeared to copulate, I covered them with the net. Whether they actually paired or not I am not quite certain. If so, they must have separated as soon as the net covered them, and when I took the specimens out they proved a ♀ *sinapis* and a ♂ *duponcheli*. Dr. Chapman says that "*L. duponcheli* is a week or so later than *L. sinapis*, i.e., one takes *L. sinapis* alone, then *L. duponcheli* appears, and is rare, then both are equally common, and finally, just before I left (April 29th), *L. sinapis* was rather rare, and *L. duponcheli* quite common." *Colias hyale*.—Just emerging; in fine condition, and capable of flying like "Old Harry." The specimens captured were evidently the fore-runners of the spring brood at Digne, where, I surmise, the insect is regularly double-brooded. I saw ten specimens on the morning of April 22nd in about two hours, and Dr. Chapman says it had become very abundant by the 29th. Frey remarks that in Switzerland there is "one scanty brood in May and June, and one numerous brood from July to September. Higher up, e.g., at Bergün, only one brood in the year." I suspect that it is the usual thing for the warmest of the Alpine valleys to produce a "scanty brood in May and June," the individuals of which, with their marvellous powers of flight, spread to the higher levels (and in some years to higher latitudes), and lay the eggs which give "the numerous brood from July to September." *Colias edusa*.—Only just appearing. A few specimens freshly emerged; evidently this species is a few days behind *C. hyale* in the date of its appearance, and is also very much less common in the south than *C. hyale*. *Gonepteryx rhamni* and *G. cleopatra*.—Both these species occurred and covered the same ground. Nothing more brilliant than the flash of a male *cleopatra* along a wooded mountain side, in the bright sunshine, can well be imagined. The specimens of *G. rhamni* were evidently

hybernators, and so, in my opinion, were those of *G. cleopatra*, nor do I observe, in the few Digne *cleopatra* captured, any difference in the size between them and *rhamni*. Does *G. cleopatra* hibernate in the same manner as *G. rhamni*? What larval and pupal differences are there? The eggs are certainly much alike, the food-plants the same, they cover the same ground here (at Digne). They are of the same size. Certain it is that at Cannes, *cleopatra* is the larger, but is this only a concomitant of increased food supply, and consequent energy resulting in larger size and brighter colour? Who, of our southern observers, can give us facts with regard to these points?

NYPHALIDÆ.—*Polygonia egea*.—Two or three specimens seen each day sunning themselves on the dark shaly rocks, in the crevices of which grows the *Parietaria*, on which the female lays her eggs. Very wary and difficult to capture. *P. c-album*.—An odd specimen or two, hibernated and very worn, were captured. *Eugonia polychloros*.—Several hibernated specimens observed. *Euranessa antiopa*.—One specimen, with most approved white border, on the Col de la Croix-Haute, evidently searching out the sallows for egg-laying. Frey says that this species is universal singly, and suggests that probably the high Alpine *Salices* explain the phenomenon. He further says that the butterfly is single-brooded, with "partial hibernation." What does he mean by "with partial hibernation?" *Pyrameis atalanta*.—Flying with *P. machaon* round the tops of the mountains. *P. cardui*.—Two only seen, and these appeared to be in fine condition; one was busy, and looked as if egg-laying, the other flying with *P. atalanta*, *P. machaon* and *P. podalirius*, about some precipitous rocks at the summit of one of the smaller mountains. This species is almost polyphagous, and appears as uncertain in appearance in most parts of Europe north of the great mountain chain as with us. I saw no *Vanessa io*, but *Aglais urticae* was locally abundant in the larval stage. Some of the larvæ were sent to Mr. Merrifield, and the earliest of these produced imagines on May 5th, at Brighton. *Melitaea cinxia*.—Widely distributed all over the neighbourhood. Well out, large, in fine condition, and moderately abundant. Frey says that in Switzerland this species occurs in meadows and low mountain pastures almost everywhere. *Melitaea aurinia*.—Just out on rather dry grassy slopes, and in meadows, becoming very abundant on April 28th and 29th. The specimens were mainly of the ab. *artemis*, Fb., but the ab. *brunnea*, Tutt, and ab. *provincialis*, Bdv., were also represented. Some of the females were very large, and came very near var. *iberica*, Oberth. (*desfontainesi*, H.-S.). I had expected to find the species here exhibiting quite racial characters in the direction of *provincialis*, Bdv., but cannot say that this altogether happened. *M. athalia*.—Just appearing. I got four specimens on April 22nd, the doctor one. I do not know whether the species became abundant later. It was a strange experience to see, on April 22nd, in a meadow almost ready for mowing, *Melitaea cinxia*, *M. aurinia* and *M. athalia*, flying with many *Brenthis dia* and an occasional *Argynnis lathonia*. I must own this day alone knocked a great deal of the London fog, accumulated during the winter of '96-'97, out of me, and made quite clear that the summer of 1897 had arrived. *Brenthis dia*.—Really abundant; some specimens were already worn. *B. euphrasynce*.—The first and only specimen taken by the doctor on April 29th, a large male.

Argynnis lathonia.—Rather small, the spring brood only just emerging. This species is regularly double-brooded in the lowlands, occurring in April and May, and again in July and August, and this prevails up to about 4,000 feet. The autumn brood, however, goes up to 7,000 feet, Frey says up to 8,000 feet in Switzerland. *Pararge egeria*.—Possibly over. A few specimens of the bright fulvous southern type were captured, flying about in the same slow manner that characterises our British form. Frey says that "in Switzerland *P. egeria* passes, in hot summers and in very warm places, into the bright yellow var. *meone*, as in Unterwallis, the Tessin Riviera and at Lugano." *P. megera*.—The first brood well out. The specimens brightly marked above, the undersides rather suffused, otherwise not differing from our British examples. *Coenonympha pamphilus*.—Common in one meadow only, occasional specimens in other localities. The doctor captured, on April 14th, the most striking specimen of the dark-bordered ab. *lyllus*, Esp., that I have ever seen. Our other captures were quite typical, and did not incline to this form. *Erebia epistygne*.—This fine *Erebia* was found on all the lower mountains, at about 500 feet above the town, and continued to their summits, but most of the individuals were worn and useless for cabinet purposes. There is a marked difference in the undersides of the sexes, but I noticed no difference in their habits. They would get up from the herbage, fly a considerable distance, and then settle again. The native collectors told us that it had been very abundant during the first week of April at Les Dourbes. *Erebia erias*.—The black glossy coat of this grand fellow reminded me of *E. nerine*. The insect was only just emerging, and very difficult to get; needless to say the few specimens obtained were in grand condition. The only female captured was paler than the males. Frey says this is a southern species, and only belongs to the southern part of the Swiss faunal region—Wallis and the Grisons. It "occurs in Wallis in May and beginning of June, and higher up in July."

Notes on a few Orthoptera captured in the neighbourhood of Cannes, in March.

By MALCOLM BURR, F.E.S.

The few specimens of Orthoptera captured by Dr. Chapman in the neighbourhood of Cannes during the month of March, work out as follows:—ACRIDIOIDEA.—TRYXALIDÆ.—*Epacromia strepens*, Latr.—One male and three females from Cannes examined. This species is common in the south of Europe, being found in the south of France, Spain, Dalmatia, Greece, and it also occurs in Algeria and Asia Minor. It may be found in the adult stage at nearly every season of the year, and seems to prefer dry hot sunny places: it flies often and higher than most Orthoptera. There are several species of the genus *Epacromia*, all very closely allied, the distinction being, according to Brunner, "überaus subtil." [There are two other European species: the rather rare *E. tergestina*, Muhl., and *E. thalassina*, Fabr. The latter is common, and differs from *E. strepens* by its more slender form, narrower elytra, hyaline wings (smoky at the apex in *strepens*), and by its more slender posterior femora. There are other points of

distinction, but these are the most noticeable. *E. tergestina*, Muhl., is quite a distinct species; the blue posterior tibiæ, with a black ring at the apex and base at once distinguish it from *E. strepens* and *E. thalassina*, in which the posterior tibiæ are red. *E. tanulius*, Fabr., perhaps better known under the synonym, *tricoloripes*, Burm., is one of the most widely distributed species in Asia and Australia.] In two of these specimens from Cannes the wings are tessellated with yellow: this is not noticed in the descriptions given by Brunner and by Finot.

OEDIPODIDÆ.—*Acrotylus insubricus*, Scop.—One male, one female, Cannes, March, 1897. One female, Digne, April 26th, 1897. This extremely pretty little species is common enough in the south of Europe, round the shores of the Mediterranean Sea, the north of Greece, Provence, Pesth, Volga, and also in Asia Minor and Algeria. In the south of France it seems to be fairly common, and was observed by Dubrony to hibernate, and appear in the following spring, which these specimens had evidently done. As in other *Oedipodidae*, the colour of the wings varies. Brunner records specimens from Aleppo, in which the red of the wings fades into yellow (vide, *Proc. Ent. Soc. Lond.*, 1897, p. xv.). [There are two other European species: (1) *A. longipes*, Charp., in which the wings are yellow hyaline at the apex, and there is no black fascia. (2) *A. patruelis*, Sturm., is closer to *A. insubricus*, but differs by its smoother pronotum, which is constricted in front and rounded behind. In *A. insubricus* the pronotum is not constricted, and is pointed behind, and the dorsal aspect is rugose; the antennæ are much longer in *A. patruelis* than in *A. insubricus*.]

Pachytylus cinerascens, Fabr.—One female, Cannes. This species is an inhabitant of western and northern Europe; it is common in the south of France, and by reason of its large size and comparative abundance, sometimes causes some mischief in gardens. It is also found in Spain, Italy, Dalmatia and Greece, but has further an extraordinarily wide distribution, no doubt caused by its great powers of flight. Outside Europe it is found in the Canary Islands, all North Africa, Egypt, Asia Minor, Syria, Mauritius, Java, Japan, Philippine Islands and New Zealand. It is often mistaken for *P. migratorius*, L., from which it differs as follows: the pronotum is produced to a blunt point anteriorly and posteriorly, whereas it is rounded in *P. migratorius*; the posterior tibiæ are reddish (livid or yellow in *P. migratorius*); the pronotum is more raised in this species than in *migratorius*; in *cinerascens* the male is considerably smaller than the female, but the sexes are about the same size in *P. migratorius*. *P. migratorius* is an Eastern species, and very rarely straggles as far westward even as France. *P. cinerascens* has even been confounded with *Schistocerca peregrina*, Oliv., a very distinct species, that may be at once distinguished from the *Oedipodidae* by having a distinct tubercle on the prosternum. In the south of France, *P. cinerascens* often hibernates and appears in the spring; the eggs that are laid in the beginning of the year soon hatch, and the insect is adult in autumn.

ACRIDIDÆ.—*Acridium aegyptium*, L.—One male and two females, Cannes, March, 1897. This fine species is common in the Mediterranean region, and, like the last species, has straggled to England,

It is found as far east as the Kirghis Steppes and Bussorah, on the Persian Gulf. In spite of its size, it does not do any serious damage to agriculture, like its near neighbour, *Schistocerca peregina*, Oliv., which is notorious.

TETTIGIDÆ.—*Tettix subulatus*, L.—One specimen only, Cannes, March, 1897. Common in Central and Southern Europe, and not uncommon in this country. It is an exceedingly variable species; in fact, Zetterstedt made four species of it, whilst Philippi counted twelve varieties, and Fieber fourteen. It is usually a dark species, but this specimen is nearly white. I have taken similar aberrations in the allied *T. bimaculatus*, L., on the chalk at the Warren, Folkestone. The species of *Tettix* are the only grasshoppers that are known to hibernate in England. Some exotic species of the group are remarkable, from their habit of leaping into running streams, and sitting on a stone, and allowing the water to completely cover them.

Contributions to the fauna of the Dauphiné Alps.

IX.—THE MOTHS OF LA GRAVE.—RESTING HABIT OF SPHINX CONVULVULI.
—LAZY DEILEPHILA EUPHORBIE LARVÆ.—ABUNDANCE OF YELLOW-
AND WHITE-COLOURED MOTHS ON MOUNTAIN PASTURES.—THE PLUMES
OF AN ALPINE VALLEY.

By J. W. TUTT, F.E.S.

If the warm wet weather experienced at La Grave was against butterfly catching and long journeys, it had perhaps one good result, inasmuch as it made us work hard for small things in the near neighbourhood of the hotel, and probably the Micro-lepidopterists will say that we got much better results than we might have done with sunnier weather. Here, too, I would acknowledge my great indebtedness to Lord Walsingham and Mr. Durrant, who have overhauled and named the greater part of my captures among the smaller fry. It would appear that La Grave is a marvellous locality for "plumes."

SPHINGO-BOMBYCID STIRPS.—**SPHINGIDÆ.**—**SPHINGIDÆ.**—*Sphinx convulvuli*.—We were pleased to find a specimen of this grand moth at rest on an old post, at a height of almost 6,000ft. above the sea-level. It is a treat to see a moth like this in its native wilds at rest, and the excellent manner in which it was protected was very striking. We remember seeing several specimens of this species resting on the wooden frames of the hop-bins, in the hop-gardens on the outskirts of Cobham Woods, in the early "seventies." Even there they were excellently protected. *Deilephila euphorbie*.—Large and apparently conspicuous as these larvæ are, it is easier to walk over them than to see them until one knows how to look for them. They were very abundant on the wayside banks and slopes all round the village. The lazy habits of this caterpillar are beyond belief. We used to keep the larvæ on the mantel-piece of the room without any covering whatever. They never left the food until the last mouthful was eaten.

GEOMETRIDÆ.—It was a wonderful sight, on two mornings, when, in a warm drizzle, the sun struggling against the rain, the mountain side swarmed with moths. Some people who have never been up a mountain sometimes talk as if all moths that inhabit high

mountains are black. Of course, rock-resting species usually are, but on the high Alpine pastures this idea is absurd. Yellow and white and black are the prevalent colours, and yellow and white usually predominate, and I believe moths which are yellow or white in colour are more independent of the sunlight to make them active. To see, as I have, on many occasions, hundreds of the golden *Lithosia lutearella*, *Cleogene lutearia*, *Acidalia flaveolaria*, the straw-coloured *Crambus culmellus*, the white *Larentia verberata*, and sheeny *Sciaphila argentana* flitting everywhere over the pastures on a warm dull morning, at 6,000 up to 8,000ft. elevation, would very soon modify the opinions of these people. True, *Odezia atrata* (*chaerophyllata*) is also there, but the specimens are just like those seen at the sea-level in Britain, the mountain environment not having modified them at all.

Fam. GEOMETRIDÆ.—*Phorodesma smaragdaria*.—A wayside insect, to be disturbed from the great clumps of *Absinthium* growing along the roadside, a very different habitat from that on the Essex coast. The specimens were getting worn. *Acidalia rubricata*.—A few fine specimens in a field just below Le Dauphin. *A. comparia* and *A. mutata*.—Single specimens only of each. This was remarkable for the latter species. *A. rusticata*.—Two specimens disturbed from *Parietaria*, in the Combe de Malaval. Rather less strongly marked than Kent specimens. *A. humiliata*.—Disturbed among the herbage on the roadside, and also on the mountains at from 5,000 to 6,000ft. *Acidalia flaveolaria*.—In great abundance on all the mountains, flying in the early morning almost everywhere. LARENTIIDÆ.—*Larentia aquata*.—Males of a delicate greenish hue; a few found resting on the rocks. *L. aptata*.—A few disturbed in the rocky gullies. *Larentia verberata*.—Common in the highest parts of the mountains. *Cidaria fulvata*.—One very large specimen, much paler than British examples, disturbed from a bush in a gully at the back of the town. FRONIIDÆ.—*Ortholitha bipunctata*.—Rather dark in colour. Very abundant, both on the banks by the road-sides and also on the lower slopes of the mountains. *O. limitata*.—Very abundant on the borders of all the pastures, among the tall weeds—*Centaurea*, *Scabiosa*, etc. *Cleogene lutearia*.—The abundant moth on the mountain sides. We saw them sometimes in thousands, flying in the early morning. *Strenia clathrata*.—Not uncommon, and not differing from British specimens. *Odezia atrata*.—Rather common, flying in the morning over the pastures. BOARMIDÆ.—*Dasydia obfuscata*.—A single specimen only, of a very fine dark form, captured whilst flying along the roadside, having been disturbed whilst at rest on a rock. *Pygmaena fusca*.—Only a few specimens observed.

ZYGÆNIDÆ.—*Zygæna toniceræ*.—Two typical specimens of this species were captured. *Z. achilleæ*.—Mostly worn, one remarkable specimen had the typical spotting on the left fore-wing, but the red spots were united into a blotch on the right fore-wing.

NOCTUO-HEPIALID STIRPS.—Noctuides.—*Noctua cuprea*, *Agrotis alpestris* and *Charaxes graminis*.—These species flew about on the mountains, at about 6,000 to 7,000ft. elevation, in the fitful gleams of sunshine. They were generally to be found in the openings of the pine woods towards the foot of La Meije. *Citria fulvago* ab. *flavescens*.—A specimen, drying its wings, was taken from the trunk of a poplar tree in the village of Le Dauphin.

DELTOIDES.—*Herminia modestalis*.—One or two specimens only.

CHELONIDES.—*Lithosia lutarella*.—In great abundance. We must have seen several thousands one morning. They were everywhere; the little crowds accumulating and dispersing, as a newly-emerged female called and paired, being very remarkable. It would have been quite easy on some occasions to have caught 20 or 30 with a single stroke of the net. *Nemeophila plantaginis*.—The type, *ab. hospita*, and *ab. matronalis*, all occurred on the same ground, and appeared pretty generally distributed above 6,000 feet.

LIPARIDES.—*Leucoma salicis*.—A single ♂ specimen in fine condition, brought to me by one of the servants at the hotel. Poplars were not uncommon in the district.

TORTRICIDES.—*Sericoris stibiana*, *S. rivulana*, *S. cespitana*.—Occurred in considerable abundance on the open pastures on the slopes leading up to the Meije. *Dichrorhampha alpinana*, Tr. [= *politana*, Gn., Wilk.].—Very abundant, flying in the afternoon sunshine, around the yarrow (*Achillea millefolium*) blossom. This plant was exceedingly abundant by the roadsides. *Cnephasia wahlbomiana*.—Not uncommon. The specimens, Durrant says, "agree with a long series of *wahlbomiana* collected by Zeller at Bergün." *Dichelia gnomana*.—One or two specimens only, not so common as at Courmayeur or at Bourg d'Oisans. *Sciaphila argentana*.—Abundant among the longer herbage on the pastures. *Penthina incarnatana*.—A few among the rose bushes on the lower part of the slopes leading up to La Meije. *Tortrix rosana*?—The larvæ exceptionally abundant on the wild gooseberry, on the way up to the Plateau d'Emparis. *Conchylis meridiana*.—One very pale specimen, much paler than *C. alternana*, to which it bears much resemblance. *Centaurea* was very abundant at La Grave.

PYRALO-MICROPTERYGID STIRPS.—PYRALIDES.—*Odontia dentalis*.—Two imagines were kicked out of the herbage by the roadside, bordering which was any quantity of bugloss (*Echium vulgare*). The specimens are very like British ones. *Botys austriacalis*.—Not uncommon on the mountains. *Evergestis (Orobena) sophialis*.—One or two specimens only. *Botys flavalis*.—The large yellow form, with scarcely any trace of dark markings on the fore-wings, was not at all uncommon on the steep shady slopes about half-a-mile below the village. *Scoparia sudetica*.—Common as usual on the mountains. *S. ambigualis*.—Two only, exactly like south British individuals.

CRAMBIDES.—*Crambus culmellus*.—This was the only really common species of the genus, and it abounded everywhere. Most of the specimens were very like British individuals, but a few were of a very dark smoky hue = *ab. obscura*, n. ab. *C. tristellus*.—A few typical specimens only observed. *C. alpinellus*.—Two beautiful specimens taken by the roadside, just below the village of Le Dauphin. I see no difference between these and the specimens I have captured at Deal. *Phycis ornatella*.—The large insect, referred to this species, and recorded from Le Lautaret (*ante*, p. 15) was also fairly abundant here. *Ephestia elutella*.—One specimen only.

PYRALIDS.—*Psecadia pusilla*.—One of the most interesting species I captured. At the back of the village was a steep gully, leading up to the cultivated plots on the sides of the mountain. In this gully were three or four old ash and willow trees, and the trunks of these trees proved the haunts of this beautiful insect. At about 8.30 a.m.

they might be found drying their wings on the grass (almost the only plant that grew on the steep banks of the gully). They were in such abundance that, although I took and set about 150 specimens from the trunks of only three trees, hundreds of specimens were then left on the others. The conspicuous white colour, with its longitudinal median black band, suggests that the insect would be very easily seen when at rest, but, in reality, the contrary is the case, and it was only that I was really out moth-catching in the wet that led me to discover it. Had I passed the trees with the cursory glance trees usually get when one is in the Alps, I should have missed it. The insect was less abundant on tree-trunks between the village and the Combe. *Hyponomeuta cognatellus* and *H. evonymellus*.—These species were disturbed from the trees on which *P. psiella* was resting. They also occurred high up the mountains within the treelimit. *Depressaria absinthivora*, Frey.—Taken among the *Absinthium* by the roadside. *Gelechia runcicorella*, *G. spurcella*, *Acompsia tripunctella* [N.B.—*Acompsia*, Hb. (nec Meyr.) = *Brachycrossata*, Hein.], *Anacamptis** *anthyllidella*, *Megacraspedus titti*, n. sp., were all brought home in order to make quite sure of identification. Had we known there was a new species, we should have been more keen on the Gelechiads. *Argyresthia sorbiella*.—One or two specimens only.

PTEROPHORIDES.—*Oxyptilus pilosellae*.—One very bright specimen only. The fore-wings are much brighter, and the hind-wings darker, than our Dover specimens. *O. lantoscantus*, Mill.—A single specimen of this large *Oxyptilus* only was captured. *O. hieracii*.—This species was not uncommon, and was disturbed from the rough herbage growing on the shady banks just below the village towards the Combe. I doubt having ever seen a British specimen of this insect. The one referred to in the *Monograph of British Pterophorina*, as captured by Coverdale, does not appear to agree with these. *O. marginellus*.—A few of this somewhat delicate species were disturbed from the *Absinthium* when I was working for *Leioptilus scarodactylus*. *O. tristis*.—A single individual of this interesting species only was captured. *Stenoptilia coprodactyla*.—A rather large form of this species was pretty abundant along the roadside just below the town, and could be taken rather freely in the afternoon. *S. plagiodactyla*.—Some very variable specimens were captured. One form has a very dark costa, another is not unlike ours, but a third form, of a delicate pale dove-grey, is a very different looking insect. *Pterophorus monodactyla*.—Common by the roadsides. *Acipitilia*† *tetradactyla*.—Fairly abundant on the pastures leading up to the Meije. *A.† xanthodactyla*.—One specimen only obtained, this occurred in the Combe de Malaval. *Leioptilus*†† *scarodactylus*.—This little species, very like *L. microdactylus*, was very abundant among the *Absinthium*. Its habits, too, were much like those of the latter species, and by working for them as we used to work for *L. microdactylus* at Deal, a very fine series resulted. *Oedematophorus rhododactylus*.—We were much astonished to disturb

* *Anacamptis* is wrongly used in Staudinger and Wocke's *Catalog*, by Meyrick, H.B., and by Auct. Curtis' genus = *Tachiptilia*, Hein., vide Wlsm., E.M.M., xxxi, 43 (1895). The proper generic title of *anthyllidella* has not yet been determined.—H. J. D.

† This genus is properly *Alucita*, L.—J.H.D.

†† This genus is properly *Pterophorus*, Geoff.—J.H.D.

four specimens of this species from the yarrow growing beneath a rose bush by the roadside. Five thousand feet appears to be a good elevation for this species. *Platyptilia metzneri*.—This insect occurred among the *Petasites*, as at Le Lautaret, but the specimens were smaller at La Grave. Lord Walsingham tells me that, "although this species was described by Zeller, he did not possess it." It looks at first glance very much like a large dark *P. gonodactyla*.

COLEOPHORIDES.—*Coleophora ornatipennella*.—This species, very like a large *C. livella*, was not at all uncommon among the clumps of *Absynthium*, whence it had evidently gone for shelter. *C. ribicella*.—Very fine and large specimens of this species were also disturbed from the *Absynthium*.

TINEIDES.—*Myrmecozela ochraceella*.—One specimen only obtained in the pine wood on the slopes leading to the Meije. *Bucculatrix absinthii*.—Although abundant on three or four plants of *Absynthium*, this little species was not at all generally distributed among the *Absynthium* in the locality.

Coleoptera near London in June.

By CLAUDE MONJEY, F.E.S.

Why is it that one likes so much better to write of the insect-fauna of any one else's district than of one's own? I have been collecting assiduously in Suffolk all the year, and yet only one tiny note of my doings is in print. Nevertheless, the moment I get away from home, and poach on someone else's preserves, I needs must put pen to paper, and show how superior are my takings to those of the *habitué*; how very much better than he I could work his own district; and, in fact, what an old slow-coach he must be not to make very great discoveries indeed in a district that appears to me—with only one day's experience—so rich in new species (simply because the geological formation, and consequently the flora, is very different from my own!) Or am I prompted by a better force—that of sympathy of man for man, and do I simply record these facts in the hope that my brother of the net and pin may read, mark, learn and inwardly digest them (metaphorically), skip such species as he is full of (figuratively), and ramble in the direction indicated, in the hope of picking up any I may have chanced upon new to his locality? Whatever the cause, here is the effect.

Ealing was the first locality singled out for trial, and my friend Mr. Ernest Elliott, F.I.I. and I jogged along on the top of a 'bus, in the most glorious weather, to the erstwhile "village," on the 18th. But the moment we reached the country it poured with rain to such an extent that one sweep, which showed up *Malthodes atomus*, *Anobium fulvicorne* and *Lissodema 4-pustulata*, was all that was possible. On the 19th we entrained for Ewell, and, walking thence to Epsom Downs, met with several unusual species, though nothing rare. *Anthobium ophthalmicum* (in great numbers), *Antherophagus pallens*, *Anaspis flava* var. *thoracica* occurred on flowers of, for the most part, *Umbelliferae*. *Phyllotreta nolicornis* was very common on *Reseda lutea*, from which we also took *Ceuthorrhynchus marginatus* and *Baris abrotani*. *Miarus campanulae* and *Orchestes fagi* were swept from *Helianthemum chamae-*

cistus beneath beech, and a few *Apion punctigerum* and *loti* from other plants. In a marshy spot not far from Wimbledon Common, on 21st, *Crepidodera helvina* and *chloris* were found not uncommonly upon poplar, *Orchestes ruscii* upon birch, while, by sweeping meadow grass, *Phyllotreta ochripes* and *Ceuthorrhynchus cyanipennis* occurred; of course, *cum multis aliis*. I caught nothing from the crowd on 22nd!

We had better luck at Ealing on 23rd, *Dasytes plumbeus* occurring not uncommonly on the dog-roses, *Anaspis subtestacea* and *flava* var. *thoracica* in damp places, and *Rhyncholus lignarius* and *Ptilinus pectinicornis* in a dead stump. I should like to here state my opinion that the so-called "var." *ferrugineus* of *Orchestes alni* is nothing more than an immature form, since I have never found it at any time of the year but this—when the insects have just emerged from the pupæ, and have not quite developed their normal coloration. In a long series, taken from June 15th to July 15th, the elytra will be found made up of almost every grade, from pure rufo-testaceous to the typical *alni*, with black spots strongly developed. Fowler says it is "found in company with the type." Of course it is, the latter being merely more fully developed examples. The former were common at Ealing. The best thing taken during the whole ten days was a single specimen of *Lasioderma serricorne*, which fell to my net near Twyford Abbey.

Betchworth, in Surrey, was our next locality, and the chalk proved productive of *Meligethes marinus* and *Ceuthorrhynchus asperifoliarum* on *Echinum vulgare*, *Bruchus cisti* and *Calandria oryzae* on *Helianthemum*, while *Athous longicollis*, *Batophila acrata*, *Mantura matthewsi* and *Oedemera lurida* disported themselves among the herbage. *Antheus floralis* would appear to be a cosmopolitan, since it occurred in both brick-and-plaster Stoke Newington, and upon the breezy cliffs to the east of Brighton, where we found ourselves on the 28th, among such nice things as *Miarus graminis*, apparently on *Helianthemum*, *Podagrica fuscicornis* on *Malva*, *Brachypterus gravidus* abundant on *Linaria*, *Hypera plantaginis*, *Amalus scortillon* and *Blechnus maurus* on the chalk, *Mordellistena pumila*, *Dasytes plumbeus* and *Malachius viridis*, which simply swarmed upon every conceivable kind of plant, on flowers, with a single specimen of *Homaloptia ruricola*.

It is surprisingly refreshing (though the former are in Lady Henry Somerset's county!), after a long spell on the "heavy lands" of Suffolk, to wander across the chalk of the North and South Downs, and note, both in the flora and fauna, things abounding which are simply unknown on the former soil, things that the "*habitué*" would pass over as not worthy of notice, but which one boxes with avidity and labels "sp. n. to my collection."

SCIENTIFIC NOTES AND OBSERVATIONS.

PAIRING OF *SMERINTHUS TILIE* (♀) WITH *S. POPULI* (♂).—On June 16th, at 11 a.m., I took a freshly-emerged ♀ of *S. tilie*, with wings not quite dry. It is just possible that she had already paired with a ♂ of her own species, but the chances are distinctly against it. I kept her alive with the hope of attracting some males of the same species, but without success. On June 18th, early in the afternoon, a male of *S. populi* emerged from a pupa in one of my breeding-cages.

As soon as its wings were dry I placed it in the box with the ♀ *tiliae*. Although I had small hope of getting them to pair, I resolved to try. Late the same evening I was very pleased to observe the ♂ *populi* evidently endeavouring to pair. When I looked at them about an hour afterwards they were, as far as could be seen, successfully paired. This was about 10 p.m. The ova were deposited during the afternoon and evening of June 19th, the ♀ dying the same night. On examining the ova this morning (July 2nd), with the aid of an ordinary lens, I could detect a larva in nearly all of them. If the egg which I am sending you fails to hatch, and I am successful with any of the others, I shall be very pleased to send some of the young larvae. It would be interesting to know if the egg shows any departure from the normal type, but I can find no description of the egg of *tiliae*, beyond the rather brief one by Mr. Bacot, in the *Ent. Rec.*, vi., 173, and another, still more slight, in Hofmann's *Die Raupen*, p. 30.—W. GROVER, Kent Villa, Harvey Road, Guildford. July 2nd, 1897.

ON THE WING EXPANSION OF *ZYGÆNA TRIFOLII*-MAJOR.—(On the morning of July 14th, at 9.15 a.m., I found an imago of *Z. trifolii*-major attempting to escape from a pupa that I had taken from the cocoon, for the purpose of description, the previous day. Dehiscence had already commenced, but the pupa was rolling helplessly on the smooth surface of a tin box in its endeavour to continue the operation. I immediately took it in hand, and, gently helping the lines of dehiscence with a pin, until the first pair of legs were free, I held the pupa firmly by the abdominal segments whilst the imago made its escape, which it did in about five minutes from the commencement of my taking it in hand, after several vermiform movements, very distinctly noticeable as they ran along the abdominal segments, not only by the eye, but also by the fingers holding the pupa. Some three minutes were occupied before the imago settled down for wing-expansion. After about three minutes longer, it was observed that the hind-wings were growing rapidly, each forming an arch concave to the surface on which the insect was resting, and to which, roughly, the wings were at first parallel. This continued till the hind-wings had attained almost their full size, and extended far beyond the fore-wings. At this point, the wings were thrown back to back, and the two pairs formed two arching curves, the convexity towards each other. The fore-wings now expanded rapidly from the base outwards, until they had extended beyond the hind-wings, which were becoming flatter. The outer margin of the fore-wings was still much wrinkled, and it took five minutes more for the last creases to be removed. The hind-wings had by this time quite lost their convexity, and the fore-wings met at that point of the costa to which the hind-wings extended; the apices of the fore-wings separating again. The apices, however, gradually approached each other as the wings became hardened. Ten minutes afterwards, the wings were allowed to fall roofwise over the body. The operation was complete, and from the time of the escape of the moth had occupied rather more than 30 minutes. There is a rapid movement of the tongue, which is repeatedly coiled and partially uncoiled during the early part of the wing-expansion. The male exudes a quantity of a pale-yellowish opaque fluid as soon as disturbed. [All the moths emerged between 9 a.m. and 10 a.m.].—J. W. TURR,

ATTRACTIVENESS OF LIGHT.—The discussion on the attractiveness of light brings forward a subject of great interest, and one which is also very puzzling, as everyone who has paid the least attention to the matter can testify. As far as this district is concerned, I have not found light by any means a productive method of collecting, but this may be in part caused by the number of street lamps, etc., causing the attractive power to be too much diffused. A moth trap was kept going three or four nights a week during the summer of last year, but the result was practically *nil*, although the lamp employed was a fairly powerful one, and the ray of light had a clear range over about half a mile of hillside covered with gardens. It is the exception to see moths in any numbers settling upon, or even flying around, the street lamps in the immediate neighbourhood. So far, two gas jets in a room with an open window have been found the most productive, but even then, four nights out of five turn out blank, although the conditions may be identical. A curious instance of the attractiveness of light came under my notice only a short time ago. On the evening of June 22nd, the house was illuminated by means of a number of "fairy" (sometimes called "bucket") lamps. These were alight for about four hours on that night only, and when they were removed, a few days after, I was somewhat surprised to find a number of moths in nearly all of them. The amount of light given by lamps of this kind is very small, so the brightness could not have been the attraction, but it would seem to suggest that coloured light—green, blue, etc., more particularly blue—is more attractive than ordinary light. Has the attractiveness of coloured light ever been investigated exhaustively? It certainly seems worthy of attention. Another question is, Why is light attractive to the males only of so many species? Mr. Bowles' contention that white- or light-coloured flowers are more attractive is distinctly contrary to my limited experience. To give only one instance: In the garden there is a patch of *Epilobium angustifolium*, the flowers are scentless (to the human olfactory sense, at any rate), purple in colour, and therefore invisible after dark. Near by there is plenty of *Oenothera biennis*, the flowers strongly scented, and pale enough in colour to be distinguished with ease at any time during a summer night, yet for every moth visiting *O. biennis*, at least twenty come to *E. angustifolium*. Other instances of moths visiting flowers which are not white- or even light-coloured enough to be conspicuous, might be multiplied indefinitely, which proves that in a large majority of instances, where flowers are concerned, moths are attracted, not by colour, but by scent.—W. GROVER, Guildford. July 9th, 1897.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

DESCRIPTION OF LEPIDOPTEROUS EGGS.—*Pygaera bucephala*.—The egg forms about two-thirds of a sphere, and is attached by its flattened end. The basal half green in colour, the upper portion opaque white, the green and white areas being sharply separated from each other. The micropylar area consists of a green circular area placed at the apex of the egg. It is scarcely a depression, so shallow is it. It is covered with large oval cells with shiny raised edges, these cells forming three concentric rings around the central stellate point forming the true micropyle. This consists of six fine

radiating ribs, meeting centrally. The shell is almost smooth, but, under a high power, is seen to be covered with a fine polygonal reticulation. The eggs are attached singly, but laid close together, occasionally slightly imbricate. [The eggs were laid on July 6th by a ♀ moth, captured in the garden at Westcombe Hill by Miss F. Clara Tutt, and described on July 7th under a two-thirds lens.]

Zeuzera pyrina.—The eggs are of a bright salmon colour, and are usually laid in masses. The egg is elliptical in outline. Length : breadth : height : : 4 : $2\frac{1}{2}$: 2. Under a two-thirds lens, the egg has somewhat the shape of a narrowed hen's egg. The shell is shiny, but covered with a fine polygonal reticulation. There are also certain irregular depressions brought about by pressure. At one pole a slightly transparent area is visible, over which the reticulation is especially well marked. I find no other characteristic micropylar structure. [Eggs received from Mr. Congdon on July 6th, described under a two-thirds lens on July 7th.] By July 16th the eggs had become strongly mottled with opaque whitish, the eggs as a whole being considerably paler in colour than when first laid. The reticulation is much more distinct and has a very regular appearance, being arranged in circles transversely. There are also traces of longitudinal striations, six in number, extending in some of the eggs from the micropylar end to its nadir, and a shallow depression on the long side. The eggs also look plumper, the irregular depressions noticed at first seem to have disappeared in many cases. The micropylar area is now seen more clearly at the free end of the egg. It is composed of concentric rings of moderately regular hexagonal cells, leading to a minute depression centrally, the cells becoming smaller towards the centre, and forming there a minute stellate point.

Abraxas grossulariata.—The eggs are attached lengthwise side by side to under-side of leaf of food-plant. Each egg is oval in shape, with rounded ends, bright yellow in colour, the surface covered with a distinct hexagonal reticulation, each hexagon forming a somewhat hollow cell. There is an oval depression on the upper surface of the egg, not quite central, the hexagons in the depression rather smaller than on the other parts of the egg. The micropyle is placed at one end, and consists of a minute star of radiating cells, placed in a very shallow depression, formed of larger well-defined pentagonal and hexagonal cells. [Eggs received July 8th from Mr. Bacot, described on July 8th under a two-thirds lens.] By July 16th the eggs had become pale straw-colour, under the lens, and the micropylar area purplish-black in colour. At each angular point of the reticulation a very distinct white shining point is now visible, as in the eggs of *Eurranthis plumistraria* and *Hemerophila abruptaria*. These are quite invisible in the newly-laid egg. The surface is shiny, and the dark micropylar end has quite a metallic lustre.

NOTES ON THE EGGS OF CERTAIN LEPIDOPTERA.—The following remarks must be looked upon as notes, and not as exact descriptions of the eggs mentioned. I was able to examine them only with a two-thirds lens, used as a hand lens, and could not mount the eggs for the purpose of more accurate description.

Pararge aethina.—The eggs are laid loosely. The egg is very little short of being spherical, although the base is slightly flattened. It is of a pale green colour when first laid, changing to a milky-white as

the embryo matures. The egg-shell is smooth, and appeared to be without any trace of ribbing. The apical fourth is almost transparent, and the micropyle, so far as it could be followed, consisted simply of a few concentric cells placed around the apex. The egg suggests to me an alliance rather with *Melanargia* than with *Pararge*.

Acidalia dilutaria (holosericata).—The eggs were laid loosely. They were pale yellow in colour when first laid, changing to orange. The eggs form somewhat flattened discs, scarcely longer than wide; length : breadth :: 4 : 3½. The surface of the egg is covered with raised points, the upper face with a central depression, the raised points apparently arranged concentrically around the depression. [The micropyle not to be detected by the cursory examination made.]

Acidalia humiliata.—The eggs were laid loosely, and consisted of flattened discs with a deep depression placed centrally on the upper surface. The eggs are somewhat variable in shape, some of them being almost circular, others rather more elliptical in outline. The surface is covered with minute knobs (points), scarcely so coarse as in the eggs of *A. holosericata*. The central depression covered with rather finer points. The raised points form rough circles passing round the depression. Laterally these points are seen to run round the whole circumference of the egg. [The micropyle could not be detected.]

Crambus tristellus.—A long cylindrically shaped egg; length : breadth :: 4 : 2½. Colour at first pale greenish, changing to dull orange, then to purplish. The egg is very distinctly ribbed longitudinally, from micropyle to its nadir, with about 12 white shiny longitudinal ribs, whilst these and the intervening spaces are crossed transversely with numerous fine, slightly raised, lines. The micropyle is placed at the slightly narrower end of the egg, in a dark coloured space, and is formed of concentric rings of very minute cells. After hatching, the egg-shells are perfectly transparent, and the young larva is more than twice the length of the egg which it has just left.

Chœrocampa elpenor.—One egg attached to a piece of lichen, the other to a piece of moss. Of a pale green colour, almost circular in outline, but still just a little longer than wide. The shell is apparently smooth, with a distinct depression on the upper edge of the egg. The micropyle is very indistinct, and consists of a finely pitted depression at one end of the egg. When the embryo is fully formed, the egg-shell is transparent, and has an iridescent gloss. [I am indebted to Mr. Christy for the eggs of this species.]

THE NEWLY-HATCHED LARVA OF CRAMBUS TRISTELLUS.—The newly-hatched larva of *C. tristellus* has a black head, almost transparent body with a slight pinkish tinge, the whole length of the alimentary canal being tinged with blood red. It is covered with simple tubercles and hairs, and the thoracic segments are larger than the abdominal.

THE NEWLY-HATCHED LARVA OF CHÆROCAMPA ELPENOR.—The newly-hatched larva of *C. elpenor* has the head and body yellow-green in colour, the legs and prolegs paler and almost transparent. The caudal horn is long proportionately to length of larva, black in colour, and slightly bifid at the tip.

All the above notes were made on July 1st, from eggs obtained the previous week at Fontainebleau, except those of *C. elpenor*, for which I am indebted to Mr. Christy.—J. W. TUTT.

EGG OF GRAMMESIA TRIGRAMMICA AB. BILINEA, HB.—Ova laid June 12-13th, 1897, scattered. Pale straw-colour, much mottled with silvery-white. Shape, $\frac{3}{4}$ of a sphere; average vertical axis, .561 mm.; average diameter, .675 mm. There are 28 (in some 29) very prominent ribs, 14 primary ones radiating from the circumference of the micropylar area, the secondary ones arising a little lower down. Between the two there are regular series of transverse ridges, slightly elevated, about 5 in each, .132 mm., which give a honey-combed appearance to the surface. The micropylar area is a pale straw-coloured space, somewhat depressed and irregular, .09 mm. in diameter, with a small rosette in the centre, .06 mm. in diameter, made up of about 14 silvery-white dissepiments radiating from the micropyle. On the third day after deposition there was a conspicuous irregular straw-coloured band, midway between the micropyle and the equator, which became darker yellow on development. There was no further change in colour, and the ova hatched on June 24th.—W. S. RIDING, M.D., F.E.S., Buckerell. July 3rd, 1897.

NOTES ON COLLECTING, Etc.

NOTES FROM CARLISLE.—Since the middle of May, Lepidoptera have been more abundant here than during the earlier part of the season. *Melitaea aurinia* was, as usual, in great force. No matter how the season affects other species, upon *M. aurinia* it appears to have no influence, and year after year it flits about its chosen haunts in hundreds, in thousands, in ———. But enough, if I say more I shall not be believed; let it suffice if I say that, unless the fields it frequents are drained and ploughed, *M. aurinia* will continue to flourish. Lepidopterists are not numerous enough here to materially reduce its numbers. *Cupido minina* was also abundant; one could easily take half a dozen with one sweep of the net. I have had two excursions for *Coenonympha tiphon* (*darus*), but have had little success with it. After waiting for over a week for a sunny day, I set out on Jubilee day, in dull blustering weather, for Bowness Moss. But it was blowing half a gale in this exposed locality, and, though I saw quite a lot of *C. tiphon*, I only secured a dozen. One has to work up to the ankles in water (sometimes up to the knees when one gets in a "peat pot"), and running is quite out of the question. On June 26th I visited the Bewcastle district, in the north end of Cumberland, and again saw *C. tiphon* in numbers, but the conditions were much the same as before, and I had hard work to get a short series. In the bleak districts which this interesting species haunts, calm sunny days are not frequent. I have "sugared" seven or eight times, and only had one good night. Several times, when meteorological conditions appeared to be perfect, not a wing was to be seen. The following are among what I have taken, and nearly all on the one good night:—*Thyatira batis*, *Cymatophora* or, *C. duplaris*, *Leucania comma*, *Cuspidia psi*, *C. leporina*, *Vininia runicis*, *V. menyanthidis*, *Agrotis segetum*, *Lycophotia strigula* (very common), *Noctua festiva*, *Caradrina morpheus*, *Xylophasia rurea* and var. *combusta*, *Apania gemina*, *A. basilinea*, *Mamestra pisi*, *Hadena nana* (*dentata*), *H. thalassina*, *H. adusta*, *Macaria liturata* and *Crambus demetellus*. On railway banks in the sunshine, *Euclidia glyphica* and *E. mi* were common among heath.

Anarta myrtilli was captured freely, and *Euthemonia russula* and *Nemophila plantaginis* were readily disturbed in the rough places in which they occur. One evening, just after sunset, I observed *Procris statice* swarming in some meadows bordering a wood. Beating hedges and bushes produced some useful Geometrids. *Lobophora sevalisata* and *L. halterata* were perhaps the best. Other species were *Numeria pulcraria*, *Cidaria corylata*, *Emmelesia decolorata*, *Asthenia candidata*, *A. luteata*, *Ephyra pendularia*, *Cidaria silaceata*, and *Melanthia albicillata*. In meadows, *Eupithecia plumbeolata*, *E. pygmaea*, *E. satyrata*, *E. exigua* were more or less common. *E. vulgata* and *E. absynthiata* could be netted along hedges at dusk. *E. indigata* was very common in low fir trees. A few *E. lariciata* were taken among larch, and I got some nice dark *E. nanata* on one of our high lying "mosses." *E. indigata* appears to be fond of resting in holly bushes; perhaps it is attracted by the flowers.—F. H. DAY, 6, Currock Terr., Carlisle. July 4th, 1897.

SPRING HYMENOPTERA FROM SOUTHERN FRANCE.—The names of the Hymenoptera captured by Dr. Chapman at Cannes and Digne last March and April are as follows:—Cannes, March, 1897.—*Mutilla maura*, ♀; *Ammophila hirsuta*, ♀; *Odynerus spinipes*, ♂; *O. parietum*, ♀; *Polistes gallica*, ♀; *Colletes cunicularia*, ♂; *Ceratina albilabris*, ♀ and ♂; *C. chalcites*, ♂; *Osmia tricornis*, ♀; *Chalicodoma pyrenaica*, ♀; *Anthophora dispar*, ♂; *Melecta luctuosa*, ♀; *Cimbex 4-maculata* var. *humeralis*, two ♂ and one ♀. Digne, April, 1897.—*Xylocopa violacea*, ♀; *X. cyanescens*, ♀. Aix-les-Bains, May 3rd, 1897.—*Gorytes mystaceus*, ♂. I am afraid all the above species are ordinary ones, and there is nothing special to remark about them.—E. SAUNDERS, F.L.S., F.E.S., St. Ann's, Woking.

SPRING ODONATA FROM SOUTHERN FRANCE.—The Odonata taken by Dr. Chapman in Southern France, work out as follows:—Cannes, March, 1897.—*Ischnura elegans*, *Sympycna fusca*. Grenoble, May 1st, 1897.—*Agrion puella*. Aix-les-Bains, May 3rd, 1897.—*Agrion pulchellum*, *Ischnura elegans*, *Agrion puella*.—W. J. LUCAS, B.A., Kingston-on-Thames.

CHESHUNT IN JUNE.—The members of the North London Entomological Society held an outing on June 19th, and, arriving by the train at 3.30 p.m., at once made their way to the marshes around the river Lea. Few Lepidoptera were observed. Larvæ of *Cucullia verbasci* were found on *Scrophularia aquatica*, the species being widely distributed in the neighbourhood. Larvæ of *Aglais urticae*, *Liparis auriflua* and *Glisiocampa neustria* were also taken. In the evening, *Miana fasciuncula*, *Hydrocampa nymphaea*, *Cataclysta lemnata* and other species were captured.—LAWRENCE J. TREMAYNE.

OXSHOTT IN JUNE.—The members of the City of London Entomological Society indulged in a field excursion on June 26th to Oxshott. Messrs. Prout and Garland proceeded to Esher, where they arrived at 11 a.m., walking from thence to Oxshott. On the way they worked the fences, which, however, produced only *Triaena psi* and *Acidalia aversata*, until they reached the Oxshott district, when *Hadena genistae* and other Noctuids turned up. *Eubolia plumbaria* was common on one part of the heath, and in a favoured spot among the pines *Plebeius aegon*, *Euthemonia russula*, *Ellopiopsis prosapiaria*,

Macaria liturata, *Bupalus piniaria* (abundant), *Aspilates strigilaria* and *Dianthoeccia carpophaga* (one) were observed. The rest of the party arrived at 3 p.m., after which the above-named species were taken more or less commonly during the afternoon, the only notable addition being *Acidalia straminata*. After tea, dusking in Steer Lane resulted in swarms of *Cidaria fulvata*, a few *Angerona prunaria*, one *Asthena luteata*, *Cidaria suffumata* (very worn) and *Hyssipetes sordidata*.—L. J. TREMAYNE and L. B. PROUT, F.E.S.

PRACTICAL HINTS.

Field Work for September and October.

By J. W. TUTT, F.E.S.

1.—On the second Saturday in September, we could, by seeking after dark with a lantern, see the larvæ of *Eupithecia succenturiata* in twenties on the upper parts of the ragwort plants, whilst during the day time they are only to be found on the lower portion of the plants, on or amongst the twisted dead leaves (Gregson).

2.—The larva of *Platypteryx harpagula (sicula)* is to be obtained in Leigh Woods, near Bristol, by beating, in the middle of September.

3.—The larvæ of *Phorodesma smaragdaria* are to be found on the Essex salt-marshes, in September, by searching *Artemisia maritima*. They are strange little atoms, with scraps of the food-plant gummed over their bodies.

4.—The larvæ of *Demas coryli* are to be beaten from beech, in the middle of September.

5.—The larva of *Platypteryx falcataria* is common in September and October, on birch and alder. The larva is conspicuous on *Alnus glutinosa*, owing to its bending the sides of the leaves upward with a few silk strands. If not within this tent, it may usually be found on the upper side of some neighbouring leaf.

6.—The imagines of *Thera firmata* are to be taken, in September and October, on the boles of fir and larch trees, just out of pupa.

7.—In September, search the flowering heads of grass growing in clearings in woods, for *Citria flavago*, *C. fulvago* and other autumnal Noctuid moths.

8.—The larvæ of *Phoxopteryx derasana* are easily detected on buckthorn, in September, by the leaves being folded over and fastened together the whole extent of the leaf. They remain in the larval state till spring, and then, after wandering about for a day or two, pupate in rough cork.

9.—The larva of *Carpocapsa juliana* feeds on acorns in September, and is full-fed about the time that the acorns fall.

10.—During the autumn, collect the common beech mast for the larvæ of *Carpocapsa grossana*. The full-fed larvæ avail themselves of cork and rotten wood in which to bore. They remain during the winter as larvæ in the cocoons, and often go over two winters in this condition.

11.—The larva of *Catoptria aemulana* feeds in the seed-heads of *Aster tripolium*, and is full-fed towards the end of September.

12.—The larva of *Catoptria decolorana* feeds in the seed-heads of golden-rod, in September and October.

13.—Collect the seed-heads of wild carrot, in September, for larvæ of *Semasia rufillana*.

14.—The larva of *Sericoris euphorbiana* is to be found in August and September, feeding in the shoots of sea spurge (*Euphorbia paralias*), which are drawn together.

15.—In September, the dirty white larva of *Penthina postrema* is to be found within the stems of *Impatiens noli-me-tangere*.

16.—The first week in October is the time to collect the full-grown larvæ of *Argyrolepis maritima*. At that time they are to be found mining in the roots of *Eryngium maritimum*, sometimes to a depth of six or eight inches below the surface of the sand. The long pipe-like roots, for about three inches of sound root beyond the mine, must be taken out very carefully, and the mined roots should not be opened, but buried upright in sand.

17.—The larvæ of *Spilodes palealis* feed in the umbels of wild carrot in September, drawing the umbels together with a web.

18.—The larvæ of *Gelechia acuminatella* are to be found in October, mining the leaves of thistles.

19.—The larvæ of *Gelechia scriptella* are to be found in September, in maple leaves.

20.—The best time for collecting the larvæ of *Coleophora fuscoctyrella* is in September and the beginning of October. It feeds on nut, and may be found underneath the little leaves at the termination of a bough.

21.—At the end of September, the mined leaves of dogwood contain full-fed larvæ of *Antispila treitschkiella*. The mined leaves should be placed on fine earth in a flower pot, covered with a glass cylinder. As the larvæ cut out their cases, remove the leaves.

22.—The larvæ of *Caradrina morpheus* are to be found commonly in October, on various low plants—wild hop, *Chenopodium*, etc., and in the garden on horseradish, etc.

23.—In October, the imagines of *Calamia lutosa* are to be found by searching the reeds after dusk with a lantern. The species has often been found to be abundant when searched for in localities where its presence was not before suspected.

REVIEWS AND NOTICES OF BOOKS.

DIE SCHMETTERLINGS-FAUNA VON HILDESHEIM.—Erster Theil: Tagfalter, by A. R. Grote, M.A. [Published by the Roemer Museum, Hildesheim. Price 6s.]—Prof. Grote has published in the *Mittheilungen d. Roemer-Museums*, Feb., 1897, the first part of a "Fauna of Hildesheim," in which the butterflies are enumerated, and the results of an original study in the neuration is given. The author endeavours to show the manner in which the evolution of the wings has progressed. He claims a diphyletic origin for the butterflies, and gives, on p. 29, a genealogical tree, in which the *Parnassi-Papilionidae* are classed together under the rubric α : "Vein ix of the primaries present, viii wanting," whilst all the other butterflies are embraced under: " β . Vein viii present as a true vein, or a scar, or finally disappears, vein ix wanting." In distinguishing the features of the neuration, the author asserts that "the diminution of the radial veins is a character of

specialisation, and that everywhere the extent of this diminution, as well as the absorption of the veins, is the measure of the specialisation." Grote finds the generalised 5-branched radius to be present in the *Papilionidae*, *Nymphalidae*, *Limnadiidae*, *Libytheidae*, *Nemeobiidae* and *Hesperidae*; whilst he states that a diminution of the radial branches has taken place in the *Parnassidae*, *Pieridae*, *Riodinidae* and *Lycaenidae*, which he looks upon as specialised groups. He considers the *Nemeobiidae* to be a distinct family from the *Lemoniidae* (called *Riodinidae*), agrees with the position Chapman assigns to the *Lycaenidae*, and considers that the aborted fore-feet of the ♂ have been independently acquired (a character of convergence). The author claims, in contradiction of Reuter, that the *Lycaenids* have probably emerged from the "Hesperid" stem, that the plan of the wing is identical, and that the difference in the neuration may be summed up by saying that the *Hesperids* retain the median system in a more primitive condition. In the *Lycaenids*, "nervure iv is absorbed by the radius, and nervure iv₂ is left in an original central position;" in the *Hesperids*, "both iv and iv₂ retain an independent position." The *Hesperids* are made out to belong to the same phylogenetic series as all other butterflies, except the *Parnassi-Papilionidae*. This diphyletic origin of the butterflies wants examining with great care, and we should hesitate to adopt it, unless special studies of ovum, larva, pupa, and imaginal characters (other than neuration) supported the conclusions that the author draws from his study of the neuration. Based on the characters pointed out, Grote considers the use of the term, "*Rhopalocera vera*," in the sense of an exclusion of the *Hesperids*, inaccurate, because "the *Papilionids* are more different from the other butterflies than are the *Hesperids*." The view taken results in re-casting the hitherto accepted classification of Bates in its broadest sense, since the *Nymphalids* are stated to be more generalised than the *Pierids*, by the retention of the 5-branched radius. The work further contains a critique of the classification proposed by Chapman upon the segmental condition of the pupa, and the author points out what he considers to be the fundamental value of the positions of the larval tubercles, as investigated by Dyar. Comstock's division of the *Lepidoptera* into *FRENATÆ* and *JUGATÆ* is maintained, a conclusion with which we disagree entirely. We are further inclined to disagree with the author, that "the *HEPIALIDES* are more isolated than any other living group of *Lepidoptera*." The four plates, on which 33 figures, showing the neuration of various butterflies, are given, will prove very useful. The nomenclature is based upon that proposed by Scudder, with some few corrections as determined by Kirby. Although this book is a useful addition to our knowledge of the neuration of the butterflies, yet the general conclusions must not be hastily adopted, and although we have every sympathy with special studies of this character, we think that they are only of use for generalisation, when compared with results obtained from other studies of special organs, and since the conclusions arrived at are here often in opposition to those deduced by Chapman, Reuter, Packard and others, we must wait with patience for some summarised conclusion which will show why this particular study gives such markedly different results from those of other students. It is a book though that all British lepidopterists should attempt to see at once.

The Entomologist's Record

AND

JOURNAL OF VARIATION.

VOL. IX. No. 10.

OCTOBER 15TH, 1897.

A description of the ova and larvæ of *T. bistortata*, *T. biundularia* and its var. *delamerensis*, and some further notes on their interbreeding.

By W. S. RIDING, B.A., M.D., F.E.S.

I have to thank Mr. Mason for a batch of ova of a Clevedon *T. bistortata*, laid on April 4th, 1896. The ova are oval, with slightly broader base, pale yellowish-green and smooth. The average length of the long axis is .782 mm.; of the short axis .561 mm. These hatched between May 2nd and 4th, and the larvæ pupated between June 14th and 17th, a period of 43 to 46 days. The egg-shell is not eaten by the young larva, and is tenacious and semi-opaque. I have arranged the description of the growth of the larva in four stages, as I found it impossible to satisfy myself as to the different moults, owing to the short periods of quiescence during changing, and to no traces of the cast-off skin remaining (with very few exceptions). Probably, however, these stages correspond with the moults.

The first, or black and white stage.—On hatching, the young larva is intense black (in a few, the black is not pure, and there is a trace of grey or brown), with pure white markings arranged in lines and spots, chiefly about the segmental divisions and the spiracles. The contrast reminds one much of the imago of *Melanippe hastata*. The white lines are most marked at the fore part of the pro-thorax, meso-thorax and abdl. segt. 1. The most conspicuous spots are arranged in front and behind each segmental division in transverse rows of 4, and on abdl. segt. 6 they form a semicircle with concavity forwards, the outer spots being the largest. The spiracular line is only indicated by large pure white bosses, more or less triangular in shape, about the spiracles. There are three on abdl. segt. 1; two on abdl. segts. 2, 3, 4, 5; three on abdl. segt. 6; none on abdl. segt. 7, and one on abdl. segt. 8. There are also a few at the sides of the thorax. Each boss has a darkish tubercle in the centre, with an erect hair. All the hairs on the body are erect and glandular (degenerated), except those on abdl. segt. 9. These and the hairs on the head are longer, curved and pointed. There is an additional tubercle, making four above the spiracles, besides those described by Dyar in his summary for the family Geometridæ. It would appear to homologise with number iii of the middle annulet of the *Tenthredinidæ*, and represent *iiia*. Those in the white bosses, on abdl. segts. 2, 3, 4, 5, will then represent tubercles *iv* and *v*; those on abdl. segt. 6, tubercles *iiia*, *iv*, *v*. The

head is black, with triangular clypeus wedged in between the lateral lobes, towards the lower part of which are five ocelli, two large and three small, arranged in a semicircle. There is a pale marking above the labrum.

The second stage is characterised by change of colour and a longitudinal arrangement of the markings. The larvæ during this stage vary in length between .5 and 1.3 cm. (2½ to nearly 6 lines). The ground colour is pale yellowish-brown, and often reddish towards the hinder parts. There are five double longitudinal lines, brownish, and mostly tinged with olive-green and waved—the dorsal, two sub-dorsals, and two supra-spiracular. The white spots of the first stage are still visible, but duller. There are traces of a spiracular line, but it is chiefly indicated by the conspicuous white bosses about the spiracles. A black or deep brown velvety mark, often edged in front by orange or red spots, begins to be developed as a blotch on the sides of abdl. segt. 2; this ultimately forms the inverted V, characteristic of stage 3. The abdl. segt. 8 is slightly humped, a prominence projecting on each side of the dorsal line, edged externally with dark brown or black, which often extends above the spiracle on abdl. segt. 6. The head is obliquely truncated, pale brown, mottled with dark reddish-brown spots and streaks. The suture between the clypeus and the lateral lobes is deeply incised at its upper part, and reddish-brown, and, with a similarly coloured mark on the latter, forms a characteristic W on the face. Above the labrum is a transverse brown line, separated from it by a pale area. Up to this stage the larvæ seem inclined to spin a good deal of web, especially when young. They then remain in the web when not feeding, and always spin it towards the light, in confinement.

The third stage is characterised by a velvety intense black (or dark brown in a few) inverted V on abdl. segt. 2. The length of the larvæ varies between 1.3 and 2.6 cm. (about 6 to 12 lines). The colouring is conspicuous for its three different shades; the darkest, central on abdl. segts. 2–5 (often black on 3, 4), and the palest on abdl. segts. 6–9. It is pale yellowish or reddish-brown, with darker markings. The dark velvety inverted V on segt. 2 is incomplete in front, passing up only to the edge of the dorsal stripe, which is often darker at the point. In a few the velvety mark is complete, and extends into the dorsal stripe. It is often edged in front with orange or red spots. Occasionally, but rarely, there is a similar inverted V on segt. 1, but it is generally imperfect and fainter. On the abdl. segts. 3, 4, 5, there are indications of similar shaped markings, but they are inconspicuous, and never intense nor velvety. There is often a great deal of black suffusion on segts. 4, 5. The sub-dorsal lines begin to disappear, and the dorsal and supra-spiracular lines, hitherto only faintly marked, to put on their black edgings, and in the case of the latter, often black suffusion with frequent discontinuity on segt. 2. The spiracular line is broad yellowish-white, mottled in some with shades of brown, and is conspicuous on segts. 2 and 6. On segt. 6 the pale colour is prolonged in front of the base of the proleg. The spiracles are placed about its centre, except that on the pro-thorax. The underside is dark as far as abdl. segt. 6, varying from black to shades of brown, with some paler longitudinal lines, chiefly central. It is pale on abdl. segts. 7, 8, 9.

The fourth stage is characterised by degradation of most of the markings, except the supra-spiracular lines, the commencement of the dorsal line and the edging of the humps; a general lowering of the tints with accompanying definition of tubercles i and ii (anterior and posterior trapezoidals), especially ii, and spiracles; and a glossy appearance assumed when full-fed on the eve of pupation.

The description of the full-fed larva is as follows—Length, 3·65 to 4 cm. (1" 5" to 1" 7"). It is slightly swollen transversely on the meso-thoracic segment, smooth and glossy. The ground colour varies from that of putty to pale yellowish or reddish-brown, with darker maculations. The dorsal stripe is edged with black or grey, swollen in the centre of each segment, and suffused with grey, or sometimes broken, but in all there is a linear longitudinal velvety black mark at the edges on the front of the meso-thorax, extending partly on to the pro-thorax. The supra-spiracular stripe is conspicuous with black edgings, in many filled up with black or dark grey, especially on the hind part of the thorax and abdl. segts. 1, 2. It has a transverse velvety intense black marking on the front of the meso-thorax. It is fainter posteriorly, often broken before abdl. segt. 2, and continuous with the dark marks on the side of the hump on segt. 8. There is a more or less distinct dull black V-shaped marking, pointing forwards, often edged in front with orange or red spots, on segt. 2 (sometimes very indistinct or absent). A similar marking is frequently traceable on segts. 3, 4. Segts. 3, 4, 5 are more or less suffused with black, the amount varying much. The dorsum is conspicuously paler on segts. 6–9. Tubercles ii (posterior trapezoidals) are very distinct on abdl. segts. 2, 3, 4, 5, each with a degraded hair; the other tubercles can also be traced. The reddish pimples on the humps of segt. 8 are seen to correspond with tubercles i (anterior trapezoidals), moved a little further back. The spiracular line is broad pale yellowish-white, more or less mottled with brown, very conspicuous on segt. 6, where it passes down in front of the base of the proleg, and somewhat less so on segts. 2, 3, 4, 5. It is darkest towards the front. The spiracles are oval, edged with dark brown, conspicuous, and those of the abdominal segments placed about the centre of the line. The undersurface, as far as abdl. segt. 6, is coloured like the upper, but darker, and often suffused with a great deal of black, either partially or entirely; there are some paler central lines. It is very pale on segts. 7, 8, 9, where colour is not required for protective purposes. The legs are darker than the pro-legs, which are of a reddish-brown colour. The head is a little smaller than the next segment, and obliquely truncated. It is pale yellowish or reddish-brown, mottled with darker spots or streaks, some forming a more or less distinct W on the upper part of the face, the inner lines of which are often very dark and conspicuous.

The second brood of *T. bistortata*.—I have to thank Mr. Bacot for ova of a captive Clevedon ♀, laid about the end of June. They hatched on July 7th, and the larvæ pupated between July 30th and Aug. 5th, a period of 23 to 29 days. The ova are similar to those of the 1st brood, but smaller. The average length of the long axis is ·726 mm., of the short axis ·5 mm. A description of the larva corresponds in all its stages with that of the 1st brood; but, taken as a whole, this brood was darker, the markings more defined and

brighter, and the characteristic inverted V on segt. 2 remained more distinct towards pupation. The full-fed larva is smaller, varying in length from 3.25 to 3.5 cm. (1" 3" to 1" 4"). Thanks to Mr. Mason, I had some other ova from a wild ♀ of the 2nd brood, taken at Clevedon. These hatched on July 23rd, and the larvæ pupated between Aug. 18th and 22nd, a period of 26 to 30 days. The larvæ of this brood were even darker than those from the captive ♀, there being a large amount of black suffusion, and all the markings remaining more intense up to pupation. The imperfect inverted V on segt. 1 was more noticeable in this brood than in any of the others, and the V on segt. 2 was more defined and persistent.

(To be concluded).

Myrmecophilous Coleoptera in 1897.

By HORACE DONISTHORPE, F.Z.S., F.E.S.

I have, as usual, devoted a good deal of time to the searching of ants' nests for beetles, during the first six months of this year. I give the result in this short note, as also the months in which I found the different species, which I thought might be useful to other collectors.

Many old friends did not turn up this year, and I only added two species new to me, namely, *Notothecta confusa* with *Lasius fuliginosus*, and *Heterothops quadripunctula* with *Formica rufa*. It is worthy of note that the latter insect has only been recorded with *Lasius fuliginosus* heretofore. The largest nest of *Lasius fuliginosus* I found was at Lymington, and though the situation—in the hollow of a large tree—was in every way favourable for working, I never found a single beetle, but a colony of *Lasius flavus* was living in the nest, both species coming in and going out together. This is very interesting, as it is not mentioned in Wasmann's *Myrmekophilen und Termitophilen Arthropoden*.

The localities worked were Oxshott, Weybridge, Tilgate Forest, Lymington and Buddon Wood. I noticed that *Formica rufa* was very early at work this year, and I took seven species of Coleoptera with this ant in January.

The following is a list of the species taken:—*Microglossa gentilis*, Maerk., with *Lasius fuliginosus*, in February, March, April and May. *Microglossa pulla*, Gyll., with *L. fuliginosus*, in February, March and April. *Oxyptoda vittata*, Maerk., with *L. fuliginosus*, in May and June. *O. formiceticola*, Maerk., with *Formica rufa*, in January and March. *Oxyptoda hæmorrhon*, Mann., with *F. rufa*, in March. *Thiasophila angulata*, Er., with *F. rufa*, in January, March and April. *Dinarda maerkeli*, Kies., with *F. rufa*, in January and April. *Myrmedonia funesta*, Grav., with *L. fuliginosus*, in April, May and June. *M. lameratis*, Grav., with *L. fuliginosus*, in April and May, and with *F. rufa* in April. *Myrmedonia cognata*, Maerk., with *L. fuliginosus*, in May. *M. lugens*, Grav., with *L. fuliginosus*, in March, April and May. *M. laticollis*, Maerk., with *L. fuliginosus*, in March, April and May. *Notothecta flavipes*, Grav., with *F. rufa*, in January and March. *N. confusa*, Maerk., with *L. fuliginosus*, in March and June. *N. anceps*, Er., with *F. rufa*, in January and March. *Heterothops quadri-*

punctula, Gyll., with *F. rufa*, in April. *Quedius brevis*, Er., with *F. rufa*, in January and April, and with *Lasius fuliginosus* in April. *Leptacinus formicetorum*, Maerk., with *F. rufa*, in March, April and May. *Batrissus venustus*, Reich., in the rotten wood of an old tree, formerly inhabited by *L. fuliginosus*, in May. *Coccinella distincta*, Fald., with *F. rufa*, in March. *Dendrophilus pygmaeus*, L., with *F. rufa*, in March and April. *Myrmeces piceus*, Payk., with *F. rufa*, in March and April. *Amphotis marginata*, Er., with *L. fuliginosus*, in May. *Monotoma conicicollis*, Aube, with *F. rufa*, in March and April. *M. formicetorum*, Thoms., with *F. rufa*, in May.

The Genus *Oporabia*.*

By LOUIS B. PROUT, F.E.S.

In taking the above title for my paper this evening, I am, to a great extent, taking up an "unknown quantity;" not so much because there is any great probability of the future discovery in remote parts of the world of species which are congeneric with those at present known, as because the whole of the known species of the group are so closely allied that their number has been variously computed at from one to six. I have employed the familiar generic title given by Stephens, though, as soon as the much-disputed claims of Hübner's *Tentamen* have been settled one way or the other, this title will have to give place to *Epirrita*. Hb., *Tentamen* (type *dilutata*, Bkh.), or *Oporinia*, Hb., *Verz.* (also with presumable type *dilutata*).

In the National Collection at South Kensington, there are a few out-lying species which may possibly bear generic relationship with *O. dilutata*; but they seem to me so very dubious that, until something is known of their life-history, I think it far best to leave them entirely out of consideration.

So far as I have investigated our two well-known British species, I incline to think that they have a decidedly closer relationship with the genus *Cheimatobia* than with Staudinger's genus *Cidaria*, in which he places them; but, to some extent, they form a link between the two. The imagines seem to me to have something in common with *Cidaria* (*Larentia*) *polata*, which in its turn is closely associated with the *caesiata* group; but they have a far stronger resemblance, both superficially and, I believe, in structure, with *Cidaria* (*Venusia*) *cambrica*, and Packard unites them in one genus; it is quite possible there is a real affinity here—I do not know *cambrica* in its early stages. The strong resemblance to *Lobophora carpinata* has also been noticed by Borkhausen and Haworth.

The larvæ bear considerable superficial likeness to those of *Cidaria* (*Larentia*) *didymata*, and another possible relationship in this direction is worth investigating, though I very much doubt if it would prove at all close.

At any rate, it will be sufficient to confine attention for the present to the species which we call *dilutata*, Bkh. (though our Scandinavian neighbours more correctly call it *nebulata*, Thnb.), and those others

* Read before the City of London Entomological and Natural History Society, May 4th, 1897.

which are so closely related to it as to have been considered, at one time or another, probable varieties thereof.

1.—*NEBULATA*, Thnb.—The common and widely-distributed, and always variable, "*dilutata*" boasts a long array of synonyms; *dilutata*, W.V., is a mere catalogue name, and the first description is by Borgström (Thunberg's *Dissertationes*, i., p. 12), who, in 1784, gave the name of *nebulata* to the ordinary cinereous form with the markings fuscous.

Neglectata (Steph. M.S.), Weaver, was erected in the *Zoologist* for 1852 as a distinct species, and the series in the British collection at Cromwell Road is still labelled by this name. It is a huge form, perhaps almost peculiar to Scotland as far as Great Britain is concerned, but Weaver's supposed distinctive characteristics—its stouter antennæ and its separate habitats—have not been found to hold. Mr. McArthur informs me that the forms occur together, and that it is simply the largest which are picked out for *neglectata*. Several correspondents have told me that the Scotch forms are, on the average, larger and finer than the southern ones, and Doubleday (*Zool.*, 1858, p. 6103) especially mentions the Perthshire specimens as being "nearly double the size of those taken in the South of England."

Precursaria, Weaver, has also been the subject of some difficulty and uncertainty—and no wonder, for he really does not describe it at all, and the name has no standing; Guenée and Staudinger refer it to *jiligrammaria*, and this may be right, as Weaver bred a specimen from a larva found on heath. But Weaver himself cites Gregson MSS., and though Mr. Gregson does not seem to have published his *precursaria* until later (*Zool.*, 1859, p. 6347), yet the name really belongs to this. He says, "It is exactly like *O. borearia* in the upper wings, but has a band across the elongated under wings, as in *O. approximaria*, not parallel with the cilia, as in *O. dilutaria*." The only specimen he records was bred in August, from a larva feeding in sallow catkins, in the central ride in Wharmliffe Wood, Yorkshire; and he admits that both Doubleday and Bond determined it as a variety of *dilutata*. By the courtesy of Mr. Sydney Webb, I have had the opportunity of inspecting three specimens labelled *precursaria*, from Mr. Gregson's collection, and there can be no doubt they are somewhat darkened, weakly-marked *dilutata*, tinged with brown, perhaps partly through age. The comparison with *O. boreata* does not seem to me particularly happy, but it gives a rough idea of the form, and is not to be changed; all nomenclators agree that the diagnoses rest primarily on a basis of *literature*, not of *type specimens*. The month in which the specimen was bred (August) is unusually early for this country, but I find several Continental records for August.

I must next refer to the most important of the doubtful species which have been associated with *O. nebulata*, namely, *O. autumnaria*, Bdv. MSS. = *autumnata*, Gn. I have had so little opportunity of studying this form, that I will not commit myself to any opinion as to its specific validity. Guenée, in erecting it, seems to me to be very disappointing; he relies solely on the following points, any of which could probably be matched in certain undoubted examples of *nebulata* (*dilutata*), through, perhaps, they may have considerable cumulative force:—(1st) The four wings concolorous, silky, of a dirty white, never greenish. (2nd) The lines all partially obliterated, only

distinct on costa. (3rd) The black mark at the bifurcation of 2nd and 3rd nervures prominent. (4th) Elbowed line (when distinct enough to be traceable) much less dentated than in the common species, and forming almost a right angle on the 1st nervure (sub-costal). (5th) Female similar to male, not smaller and stronger marked, as in *nebulata*. (6th) The larva confined to birch, and entirely green, without the red markings of *nebulata*. Nos. 1, 2 and 3 of the above I dismiss as absolutely valueless for purposes of differentiation. No 4 is interesting, because associating this form rather with *filigrammaria* than with normal *nebulata*; yet I have seen specimens of the latter (very occasionally) with the elbowed line considerably angulated. The angulation of this line, the silky aspect of the insect, the equality in the size of the sexes, and the specified food-plant (birch) are probably the principal causes of the dire confusion that has arisen between this *autumnata* and the *autumnaria* of Weaver and Doubleday, etc.—a confusion of which I shall speak further presently. Regarding Guenée's 6th distinction—that of the larva—he himself admits that the two species are extremely close; it seems to me not only useless, but positively misleading, to appeal to the absence of red markings; even our Epping Forest specimens, on oak, etc., are often devoid of these; while Schöyen states (*Arch. Math. og Naturvid.*, vol. iii.) that in Scandinavia (where, be it remarked, the usual food-plant is birch) they have never been found red- or brown-spotted, but always uniform green, with yellowish lateral lines and lighter beneath. As I have not seen any Scandinavian examples, of course I cannot say positively that the species may not be one of the *filigrammaria* group; the mention of yellowish lateral lines in the larva, together with Aurivillius' description of the ♂ genitalia, may perhaps point in that direction.

Whether this *autumnata* of Guenée's be a variety or a species, it will probably require re-naming; its erection only dates from 1857, and it is in collision both with *autumnata*, Bkh., and with *autumnaria* (Dbl.), Weaver (*Zool.*, 1852).

(To be continued).

On a collection of Spring Rhopalocera made in the Riviera, with some considerations concerning the hibernating stage of certain butterflies.

By J. W. TUTT, F.E.S.

The stage in which some of our butterflies hibernate has long been a puzzle to me, and I have long suspected that a definite knowledge of the habits of certain species which have been but little observed in Britain, can only be cleared up by a close study of the habits of the same species on the Mediterranean littoral, which appears to be the region in which they exist under the most favourable conditions. Unfortunately, the notes scattered throughout the magazines do not as a rule afford much aid, and may often, indeed, be positively misleading. When, therefore, I knew that Dr. Chapman would spend the early spring in the Riviera, I felt quite satisfied that some reliable information as to the habits of certain

species would be forthcoming. Since Dr. Chapman's return he has kindly handed me the insects captured, and I have carefully compared the results with Millière's *Catalogue Raisonné des Lépidoptères du Département des Alpes-Maritimes*, published in 1872, to which I have made many references in the following notes. I would ask my readers to carefully study the remarks that follow in conjunction with the paper, "The hibernating stages of British Butterflies" (*Ent. Rec.*, viii., pp. 97-102).

In February, Dr. Chapman took or observed the following species:—*Lampides boetica*, *Pieris rapae*, *Anthracaris belia*, *Pyrameis cardui*, *P. atalanta*, *Aglais urticae*, *Eutranessa antiopea*, *Eugonia polychloros*, *Pararge egeria* and *P. megera*.

Lampides boetica.—Chapman caught one worn specimen in February. Warburg gets an odd one very early most years; rarely, however, more than one. Rühl mentions a capture at Cannes, in "December." Millière says, in his *Catalogue des Lép.*, that *L. boetica* "occurs only in August and September." Newman, in his *Brit. Butts.*, p. 118, makes the species hibernate as an egg, and in his circumstantial account suggests that this information is derived from Millière. Believing that Millière was really responsible for the statement, I have accepted it in my paper, *Ent. Rec.*, viii., p. 99. I have a suspicion that this, like so many others of Newman's accounts, may have been entirely due to his imagination, and this suspicion is strengthened by Newman's further statement:—"The last disclosed females of this species lay their eggs on the twigs of the bladder senna (*Colutea arborescens*), but, like those of several, and perhaps all, the British species of this family, they do not hatch until the following summer." This is, of course, utterly absurd, for *Lycaena arion*, *Cupido minima*, *Polyommatus astrarche*, *P. bellargus*, *P. corydon* and *P. icarus* hibernate in the larval stage, whilst *Cyaniris argiolus* (and, according to Rühl, *Nomiales semiargus*) hibernate in the pupal stage, *Plebeius aegon* being the only British "blue" positively known to hibernate in the egg state. I am becoming distinctly inclined to believe that *Lampides boetica* hibernates, if it really exist in Europe in the winter in any numbers at all, in the imago state. Millière's statements that "the larva lives in June and July in the siliquas of *Colutea arborescens*," and "the imago occurs only in August and September," suggest very strongly that the main brood is an autumnal one, and the further records of this species, such as "August" for Rome and Nantes, "September" for Pisa and Lombardy, "October" for the Campagna, Nizza, etc., support this opinion, and the capture of the imago in a worn condition, in December, January and February, at Cannes, suggests strongly the imago as the hibernating stage. But there is direct evidence, besides the fact that the species has been caught at Cannes in the winter months, to show that Millière is wrong in the statement that the species "occurs only in August and September," for Rühl (*Die Palaearktischen Grossschmetterlinge*, p. 225) gives the "middle of June" for Spain and the Greek Island, Naxos, "end of June" for Catania, the "middle of July" for the French Pyrenees, Algiers and Gibraltar, all suggesting a summer emergence, whilst the statement of the same author, that, "near Bilbao, in Asturias, the specimens of the first brood are very large, whilst those of the second generation are smaller and darker coloured," leaves no doubt upon this point. Whether

there is not, even, another brood in favourable localities, is open to question, for records occur in which "March" is given as the time of its appearance in Cairo, Algiers and Bona, the "end of April" for Port Said. It would appear that in North Africa, in suitable places, this cosmopolitan and migrating butterfly has many of the habits of *Pyrameis cardui*, emerging late in September and October (this brood living in the imago state some time), imagines appearing again in March and April, again in June and July, and so on. The habit ingrained into the species in its tropical habitats it carries with it on its migrations, and, presumably, attempts (with the result of some modification) to do elsewhere what it does there with safety, resulting in some uncertainty in its appearance in all those parts of the area where it only occurs sporadically, and, as a result, probably, of its migrating tendency. Another statement made by Rühl may lend support to this view. He says (p. 749): "Bei Bordighera wurden Mitte Oktober Eier auf *Medicago sativa* (Luzerne) gefunden," which points to an attempt to be continuously brooded.

Pieris rapae.—This species hibernates in the pupal stage, as with us. Some pupæ sent to me last winter from Florence, by Dr. Chapman, did not emerge until the end of April in my room, some six weeks later than the time they would probably have emerged in Italy. This suggests that the southern pupæ are delayed in emergence in our climate.

Anthocharis belia.—Millière gives "March and April" for the insect, at Cannes. Norris gives "April 2nd, onwards," at Hyères (*Entom.*, xxii., pp. 182-185). Not only did Chapman get imagines in February, but, by the middle of April, he had obtained pupæ from eggs laid by these early captured imagines, and these produced the var. *ausonia* some fortnight after, whilst in Mr. Merrifield's possession. It is possible that the two broods overlap, but Norris' later specimens must have been largely var. *ausonia*.

Pyrameis cardui.—I have previously (*Ent. Rec.*, vii., pp. 110-111) given an account of the hibernating habit of this species, so far as I can unravel it. I find Millière strongly supports my conclusion. He writes of the insect, at Cannes, as follows:—"It is very common all the year, even in December and January," whilst Chapman informs me that it is "occasionally seen during the winter, but is then certainly not common." Blackmore says that it was "very abundant in Morocco," in 1869, throughout February, March and April.

Pyrameis atalanta.—Mr. Wolfe has shown that *Pyrameis atalanta* sometimes attempts, in Britain, to pass the winter in the larval state, and details (*Ent. Rec.*, viii., p. 4) such an attempt, when, in 1893, he "obtained larvæ up to the last day of October, but, although all pupæ and larvæ out-of-doors were afterwards killed by the severe frost, indoors, imagines appeared in December, January and (one at least) in February." It is well known that the imago of this species never goes into hibernation in the autumn in Britain until obliged, feasting first on the hop-catkins and later on ivy bloom. Millière says that, at Cannes, "the generations succeed each other all the year," and, in Morocco, Blackmore records it as "very abundant" in February, March and April. Chapman says that during last winter, at Cannes, "*P. atalanta* was always in evidence, the same individuals at the

same places (apparently, and probably really) all the winter, the imagines not emerging or ovipositing as far as one could judge, but hibernating, without hiding away, except on dull and cold days."

Eugonia polychloros.—This species, Millière says, "appears in March, and a second generation occurs in June," thus suggesting a March emergence, yet he says:—"Often, in winter, one sees specimens of this species flying in the sunshine, but these have passed the bad weather hidden in the hollow of a tree or in the fissure of a rock." So, I think, have the March specimens. Certainly those I saw in April, at Digne, had done so. Baker gives *E. polychloros* as "abundant during the whole of February around Lambessa," in Algeria, in 1885, whilst, in May, he found the newly emerged specimens in the form of var. *saturata*, at Guelma. The hibernators are sometimes on the wing in England, in late March and early April, but we get no freshly emerged specimens until July. A few individuals of this emergence, however, instead of going into hibernation, pair, and, I suspect, lay their eggs and die, the larvæ being killed off by frost. I know of no record of a brood occurring in South Europe and North Africa, in August and September, but the emergence of the imagines in June (Cannes) and May (Algeria) suggests that a partial second brood might be successful in these districts, and that the occasional attempt of some specimens to produce one in Britain denotes the remnant of an old double-brooded habit in the species.

Euranessa antiopa.—Of this hibernating species Millière writes: "Paraît au premier printemps, en juillet et en septembre. Les sujets qu'on voit voler dès le milieu de mars, ont passé l'hiver." I very much doubt *E. antiopa* having two separate summer broods, although it is quite possible. Frey remarks that it is, in Switzerland, a single summer-brooded species "with partial hibernation." What does he mean by "partial hibernation?" I have already (*Ent. Rec.*, viii., p. 202) discussed Scudder's remarks on the wintering of this species.

Pararge egeria.—The specimens, of course, are of the southern form. Millière says: "The larvæ are common in April and September," suggesting a summer and autumn brood. The April larvæ are evidently the progeny of the February and March imagines, which Millière seems to have missed. The first brood was even over at Digne (2,000 feet elevation), before the middle of April (1897). The species is possibly continuously brooded in the Riviera all the year. Blackmore says that, in 1868, the southern form was "common in Morocco (Tangier)" throughout his stay "in February, March and April" (*P.M.M.*, v., p. 299). It certainly is abundant in February and March, again in May and June, again in August, and yet again in October, in southern France. It tries three broods in England in very fine seasons (*e.g.*, 1893).

Pararge megera.—We get only two broods of this species in Britain, but they are exceedingly regular in their appearance, *viz.*, May and August. Millière gives three broods for the Alpes-Maritimes—April, June and October. Chapman's February specimens suggest a fourth brood, but it is possible that the progeny of the October females feed slowly up, and come to maturity irregularly through the winter from December to March, for Chapman informs me that "*P. megera* was seen all the winter, in November and December, as well as

February." It has been shown by Merrifield, Williams, Carpenter and others that *P. egeria* can pass the winter in Britain, either as "pupa" or "larva," and it is possible that, in the south of France, this double hibernating stage may also be possible in this species.

The following species were taken by Dr. Chapman in March :—*Spilothyrus alceae*, *Syrichthus malvae*, *S. sao*, *S. alveus*, *Thanaos tages*, *Cyaniris argioides*, *Polyommatus baton*, *P. icarus*, *P. bellargus*, *Nomiades cyllarus*, *N. melanops*, *Everes argiades*, *Chrysophanus phlaeas*, *Callophrys rubi*, *Papilio podalirius*, *P. machaon*, *Thais polyxena* var. *cassandra*, *T. medesicaste*, *Fieris rapae*, *P. napi*, *P. daphidice*, *Euchloë euphenoides*, *E. cardamines*, *Leucophasia sinapis*, *Gonepteryx rhamni*, *G. cleopatra*, *Colias edusa*, *C. hyale*, *Polygonia egea*, *P. c-album*, *Argynnis lathonia*, *Brenthis dia*, *Melitaea cinxia*, *Coenonympha pamphilus*, *Erebia epistygne*.

Thanaos tages.—The hibernating stage of this species is well known, viz., the larval. Rühl's records (pp. 681-682) suggest that it is pretty generally double-brooded on the Continent. He notes of *T. tages*: "Haute-Garonne. 2-3 Generationen, Mai-September."

Spilothyrus alceae.—Millière writes of this species as *malvae*, Fab. = *alceae*, Esp. = *altheae*, Hb., and gives it as appearing in May, June and July. I have taken it at Bourg d'Oisans in August (1896), and at Aosta also in August (1894), so that Chapman's capture, combined with the fact that I also took it at Digne in the middle of April this year, makes it undoubtedly double-brooded. Frey gives *S. alceae* (*malvarum*) as being double-brooded in Switzerland, appearing in May and August. Blackmore says that he took a few examples of *S. malvarum*, Ill., var. *australis*, Zell., early in February, 1868, in the village of Marshen, near Tangier. Rühl (p. 654) writes:—"Die Raupe der 2 Generation überwintert in einem gespinnst, welches in dem umgeschlagenen Rande eines Blattes angelegt ist und verpuppt sich, ohne wieder zu fressen, im April; von anderer Seite wird angegeben, dass die Raupe auch in hohlen Kletten- oder Distelstengeln überwintere."

Syrichthus sao.—This was only just coming out at Cannes during the first week of April, and did not appear until the last week of April at Digne. Millière says: "Vole en nombre sur les pelouses les mieux exposées, en mai, juin et septembre."

S. malvae.—I refer several of Dr. Chapman's specimens to this species, although Millière does not give it as occurring in the Alpes-Maritimes. It is well known that *S. malvae* hibernates in the pupal stage. Rühl's records suggest that it is pretty generally double-brooded in southern and central Europe.

Cyaniris argioides, *P. icarus*, *P. bellargus*.—The hibernating stages of *C. argioides* (pupa) of *P. icarus* (larva) and *P. bellargus* (larva) are well known.

Nomiades melanops.—Millière says that *N. melanops* "lives in the larval state in a lethargic condition for ten months." This is very similar to the habit of *Cupido minima*. But he also says of it: "Il écote en mai et vole dans les lieux où croit le *Dorycnium decumbens*. C'est sur cette plante que vit la chenille en juin." Certainly, it was well out around Cannes before the end of March, and by the middle of April was quite worn at Digne. This species also occurs in Algeria in March.

Of *N. cyllarus*, Millière says: "On le rencontre en mai et juin dans

les bois clair-semés." These months are much too late, as March and April are evidently the months for this species, even at Digne, at 2,000 ft. elevation.

Polyommatus baton.—This species occurs very early in March, and Millière discusses it under the name of *hylas*, Hb., a name, I observe, that Oberthür maintains. He says: "Le type nous manque, mais la var. *panoptes* vole communément en avril sur les terrains rocheux à base calcaire où croit le thym." Kane says that var. *panoptes*, Hb., "is darker than the type, and the rusty band of underside absent." Some of the specimens taken at Cannes exhibit a very well-developed orange marginal band, which appears to be Kane's "rusty band," and if this be really the only point of distinction, certainly the type occurs at Cannes. Of its mode of life Rühl (p. 756) writes of the larva: "Lebt von Ende April bis Ende Mai an *Thymus serpyllum* und *vulgaris* und nährt sich besonders von den Blüthen dieser Pflanzen. In der Gefangenschaft fressen die Raupen einander und die Puppen an. Verpuppung zwischen Pflanzenüberresten am Boden. Puppe kurz und rundlich, vorn und hinten verschmälert, glatt, lehmig gelb, an den Flügelscheiden grünlich angehaucht. Entwicklung theils noch Ende des Sommers, theils erst im März oder April des nächsten Jahres."

Everes argiades.—Chapman found both sexes of this species, quite worn, at Cannes, in March; he also took a very fine specimen at Digne, towards the end of April. I have taken it at Aix-les-Bains, very worn, in late August. Millière does not mention it as occurring in the Alpes-Maritimes. There seems to be a general consensus of opinion that it winters as a larva, except that Rühl says that "bei Permskoe-Müleki (Amurgebiet)," it occurs in April, "nach der Ueberwinterung." The same author mentions the first brood, which is known as ab. *polysperchon*, as occurring in Elsass, Zurich, etc., in April and May.

Chrysophanus phlaeas.—The hybernating stage of this is well known. Even in England the larva feeds a little, except in the hardest weather. In the Alpes-Maritimes, Millière says: "Vole presque toute l'année et partout." Baker says it was common at Lambessa in February, 1885, whilst the summer form, *eleus*, occurred at Guelma in June.

Callophrys rubi.—It is well known that this species hibernates as a pupa. It comes out very early in southern France. Millière says: "Cette espèce se montre dès la fin de février dans les bois taillis autour des haies." I have never heard of second-brood specimens.

Papilio podalirius, *P. machaon*, *Thais polyxena* var. *cassandra* and *T. medesicaste*.—These are all well-known to hibernate in the pupal stage, and therefore it is more or less a matter of temperature, sufficient for their development, which settles the earliness or lateness of emergence.

P. podalirius.—Millière gives the commencement of April and the end of August; late dates for both broods, as I have taken the second (? third) brood at Aix-les-Bains and Chambéry, by July 25th, whilst at Guelma, in 1885, Baker found the second brood out in June, the specimens being between var. *feisthamelii* and var. *latteri*.

P. machaon.—Of this species Millière says, "flies in May and June

and September, almost everywhere in the lower mountains, as well as in the plain." These dates may mean anything. The first brood is abundant all over southern France in late March (and in middle April at 3,000 ft. (mountains round Digne). The second brood was out at Digne, in 1890, in June (*F.M.M.*, xxvi., 282), and is usually going over in July in many localities, and abounds up to 5,000 feet in early August. Probably there are three emergences in the Riviera if the species were properly observed.

Thais polyxena var. *cassandra*.—Of this, Millière says, "is not rare in March and April," agreeing with Chapman's observations.

Thais medesicaste.—Millière does not give the date of appearance. In Tangier, Blackmore says it was common during the month of March, in 1868. At Hyères, which should be at least as early as Cannes, Norris records (*Ent.*, xxii., p. 182) it as "first seen April 13th," evidently a misleading statement as to the actual date of its first appearance in the Riviera, in 1889, unless, indeed, 1889 was a very backward season.

Pieris napi, *Pieris brassicae*, *P. daphidice*, *Euchloë cardamines*, *P. euphenoides*, *Leucophasia sinapis*.—These species all hibernate, as is well known, in the pupal stage, and their appearance so early in the year, therefore, causes no surprise.

Pieris daphidice.—Millière says that this species "flies commonly in the 'garigues' and cultivated places, from the end of March almost to the end of autumn." There can be no doubt, however, that the broods are moderately distinct, although whether there are two or three is not clear. Norris says that, in 1889, *P. daphidice* was "common at Bordighera from the beginning of February, and var. *bellidice* was rare." I was under the impression that specimens of the first brood were all called var. *bellidice*, that it was, in fact, a seasonal form; the apices of the tips of the fore-wings are distinctly pale (greyer) in the spring specimens. Blackmore (*F.M.M.*, v., p. 299) says that he saw several specimens of a *Pieris*, which he thinks must have been this species, early in February, in Tangier, in 1869, whilst Baker records it as being "plentiful in February, 1885, around Lambessa." It was getting quite *passé* at Digne, this year, by the middle of April, and yet in June, 1890, Jones records it from the same locality as occurring occasionally. This would suggest that the June specimens (recorded for the Riviera, Tuscany, etc.) are a second brood; whilst the late August specimens comprise a third brood. We found the latter brood exceedingly abundant about August 21st, at Aosta, in 1894.

(To be concluded).

The Neuration of the Lepidoptera.

By PROFESSOR A. R. GROTE, M.A.

The object of this notice is to draw attention to the fact that the methods employed hitherto in the published drawings of the wings of the Lepidoptera are inefficient, and to recommend the employment of photography as used in the *Mittheilungen aus d. Roemer Museum*. Take, for instance, the publications of Mr. Meyrick. I have not found, so far as I have yet checked the results, one instance where the

neuration is correctly given, either in the *Handbook* or the *Trans. Ent. Soc. London*, by this author. Not only is the shape of the wing quite out of correspondence with the originals that I have compared, but the distances, relative direction, and, at times, the point of origin, are frequently all wrong. Worse than this, Mr. Meyrick supplies nervures which have no existence, as in the primary of *P. macularia*, which has no nervure ix, and omits nervures, as in the figure of the primary of *Colias edusa*, *Handbook*, p. 350, which has a distinct viii in nature (compare my figure in the *Butterflies of Hildesheim*, Taf. ii., fig. 7, of *hyale*). The diagnosis of *Gonepteryx*: "Characters of *Colias* (= *Eurymus*, Scudd.) but forewings with 10 separate," is incorrect as it stands, since the greatest point of distinction, the position of the radial veins on costa, is ignored. The "præ-costal spur" of *Leucophasia sinapis* (L.c., 352) should be compared with my figure 10, to see the wide difference. But among the butterflies, the figure of *Argynnis adippe*, p. 328, exhibits Mr. Meyrick's work at its worst. I am quite unable to recognise this figure as representing an *Argynnis*. I am, myself, the victim of Mr. Meyrick's talent in the direction of drawing the wings of the *Geometridæ*. Relying upon the figures in the *Trans. Ent. Soc. London*, I have stated that viii and ix are present in the *Geometridæ*; viii represented by Mr. Meyrick as a dotted line, therefore as a fold or scar, and ix as a nervure, represented by Mr. Meyrick as a continuous line. Now I find viii to be no fold, but a "tubular," sometimes broken, nervure, and ix to be totally wanting. Mr. Meyrick reproaches Guenée with "pseudo-scientific work," in the Preface to the *Handbook*. The difference between the two is, that M. Guenée, in his Preface, awakes to the fact that the execution of his work is much less perfect than he had dreamed, while, in his Preface, Mr. Meyrick dreams that the execution of his work is quite perfect, which it is far from being. The nomenclature is often incorrect, the phylogeny wholly unsupported and imaginary, the arrangement opposed to common sense, and from this point of view, "unscientific." But all subjective criticism may be here considered superfluous in the face of the fact that in the treatment of the neuration, Mr. Meyrick himself offers the best illustration of the "perhaps not very creditable work," which he condemns in the Preface to his idiosyncratic publication.

List of Rhynchota-Heteroptera collected by Dr. Chapman at Cannes in March.

By G. W. KIRKALDY, F.E.S.

Through the kindness of Mr. Tutt, I am enabled to add to my collection the RHYNCHOTA collected by Dr. Chapman at Cannes last March, and to draw up a list for *The Entomologist's Record*, etc.

The forty specimens comprise twenty species, and are practically those that one would expect from a visit during the early spring to that locality. Six species have a more or less restricted meridional range, the remainder being fairly widely distributed throughout the Palearctic region (twelve occurring in the British Islands, these being denoted by an *).

PENTATOMIDÆ. — *Pentatoma fuscispina*,* Boh., three specimens;

Pentatoma prasina,* Linn.; *Nezara viridula*, Linn.; *Piezodorus lituratus*,* Fab. [= *incarnatus*, Germ., *Putoz Catal.*, 3rd Edn.]; *Rhaphigaster griseus*, Fab., two specimens; *Strachia oleracea*,* Linn. This is a variable species as regards colour, though the pattern is generally fairly constant. There are two examples in the collection, one a large crimson-marked aberration, the other small, and marked with white. *Strachia decorata*, H.-S., two specimens, apparently restricted to meridional Europe; *Arma custos*, Fab., distributed through meridional Europe, but not common. Fam.: COREIDÆ.—*Stenocephalus agilis*,* Scop., two specimens. Fam.: LYGEIDÆ.—*Lygaeus militaris*, Fab.—This is also another meridional species; *Ischnorhynchus resedae*,* Pang., var. *geminatus*, Fieb., an exceedingly handsome and common little species, four examples; *Henestaris lateiceps*,* Curt., four examples; *Heterogaster urticae*,* Fab. Fam.: HYDROMETRIDÆ.—*Hydrometra stagnorum*,* Linn.; *Gerris najas*,* Geer., three specimens; *Gerris gibbifera*,* Schuml., four specimens. Fam.: REDUVIIDÆ.—*Pygolampis bidentata*,* Fourcr. [= *bifurcata*, Gmel.], distributed all over Europe, but rare. Its place in the British list depends upon a solitary record by Rev. T. A. Marshall [vide, Saunders, *Hem.-Heter. Brit. Isl.*, 161, 1893]. *Pirates hybridus*, Scop. [= *stridulus*, Fab.]; *Nabis viridulus*, Spin., two specimens. A Mediterranean sp., occurring on *Tamarix*; a great deal has been written on the colour-meaning of this and the other tamarisk-bugs, which are generally greenish, varyingly marked with rose. Fam.: CARPIDÆ.—*Psallus*, sp. (?), three specimens. Mr. Saunders tells me this is probably *aurora*, M.R., a species found in meridional France and Spain, but that the condition of these individuals is not sufficiently good for a positive determination; there are more than 50 Palearctic species of this genus known, all closely related.

I have to express my indebtedness to Mr. Edward Saunders for kindly looking over my determinations, and identifying some of the critical species, and to Dr. Chapman for information regarding the localities.

Some remarks on Dr. Lukis' account of the introduction of *Callimorpha hera* into Britain.

By J. W. TUTT, F.E.S.

It has for many years been an open secret that the late Edward Newman introduced *Callimorpha hera* into Britain. By some oversight I quite neglected, in my article on this species (*Ent. Rec.*, vii., 97–101), all reference to the note on this subject which is to be found in the *E. M. M.*, vol. xxviii., pp. 21–22, dealing with the account given by Dr. F. C. Lukis of the share he had in obtaining eggs, etc., for putting the insect down in various parts of England. Attention, however, was drawn to the fact by my friend Mr. Luff (*Ent. Rec.*, vii., pp. 173–174). On looking over Dr. Lukis' original account (*Guernsey Guide*, 1863, p. 166) of the request to him for, and subsequent obtaining of, eggs and larvæ, I have just been much struck with the fact that Dr. Lukis makes the insect hibernate in the egg stage. He says:—"The parent moths were carefully collected, and eggs obtained in satisfactory abundance. Doubts and fears still hung over them until

the following spring, to be removed suddenly one morning by the welcome appearance of several dark little caterpillars creeping out of their respective shells," etc. Now this is rather amazing, considering that the larva hatches in the autumn, and the insect hibernates in the larval stage. There is, however, another statement suggestive of a fairy tale, for which Dr. Lukis' informant as to the success of the experiment is possibly responsible. It reads: "They bore the long journey admirably, and, safely arrived, were soon divided into several groups, some of which were set at liberty. These thrived wonderfully, and established themselves completely, and have since spread through large districts in Yorkshire, being recently found even on the borders of Wales; and probably also have spread in other directions, so as to claim a place in the British list, which, indeed, the author referred to has been complaisantly pleased to allot them in his work, with what justice the reader may determine as he may." This was written in 1863, but the history of the insect's distribution will no doubt come as news to most British lepidopterists in 1897.

[NOTE.—Mr. Hewett has kindly handed us the detailed notes which he received from various correspondents whilst writing his paper on the Tephrosias. He has suggested that some of these communications are worth publishing at length, and we have much pleasure in complying with the request that we should do so.—ED.]

***Tephrosia bistortata* (*crepuscularia*) as a Scotch insect.**

Tephrosia bistortata (*crepuscularia*) occurs at Perth fairly commonly every year. The earliest date on which I have taken the species is April 28th, and the latest May 21st. The best time to get the species in numbers in fine condition is from May 5th to May 10th; after the latter date they are not worth taking. *T. bistortata* (*crepuscularia*) does not appear to be double-brooded at Perth; in fact I never saw a specimen after May 21st. *T. crepuscularia* (*biundularia*) does not occur here. *T. bistortata* varies but little in the Perth district; the females, as a rule, are lighter than the males. The specimens are obtained within two miles of Perth, in a locality the height of which above the sea level is from 600 to 700 ft. The temperature (whilst the species is on the wing) is from 60° to 65°. The larvae occur on larch. I have taken one or two larvae from wild rose, near to which plenty of larch grew, and also one from birch.—R. LAWSON. Sept. 28th, 1896.

T. crepuscularia (*biundularia*) does not occur at Perth. Last year (1895) *T. bistortata* (*crepuscularia*) was very abundant, both at Kinnoull Hill and at Kinfaun, both of which places are at a considerable elevation. This year (1896) they were scarce. The Kinnoull specimens are of the normal Perthshire type of this species, but the Kinfaun specimens were dark in the males, whilst the females were very light, and a few were found of normal colour. They were mostly found on trunks of larch and Scotch fir. The earliest date I have taken them here was upon April 10th, the latest was the second week in June. I sent Mr. Tutt a rather long series of the Kinfaun specimens last year, one of which, a female, was nearly white, Mr. Tutt remarking that

the white form was very interesting. This year I paid a visit to Birnham Hill, $15\frac{1}{2}$ miles north of Perth, during the second week of May, and there took *T. bistortata*. Birnham Hill rises to a height of 1324 ft., and at the top is a clump of larch and fir. *T. bistortata* occurred principally upon the larch. Last year I obtained a small batch of larvæ from Kinfaun insects, and sleeved them upon a geranium, and on this they fed up remarkably quickly, pupated, and the moths emerged during last February; but, strange to say, they did not produce the Kinfaun form, but the form which occurs near Perth. The insect is not double-brooded here.—E. R. BUSH. *October 6th, 1896.*

The earliest date on which I have taken the Perth form of *T. bistortata* is April 27th, and the latest the last week in May. The insect is in its prime from May 4th to May 10th. I do not think really melanic forms occur at Perth, but the males are generally darker than the females, and vary much.—J. WYLIE. *October 28th, 1896.*

I used to take a large form of *Tephrosia*, of a rich brown colour in Scotland, on larch trunks, towards the end of May. It was single-brooded. We used to call it *T. laricaria*. I took these specimens of *T. laricaria* (*bistortata*) for several years about 1860, at Ardentinnie on Loch Long, in Argyleshire. *T. crepuscularia* (*biundularia*) did not, I believe, occur there. I never saw it.—T. A. CHAPMAN, M.D., F.E.S. *October 18th, 1896.*

I have only once taken a single example of the *Tephrosias*, under discussion, in Morayshire, and I copy the following extract from my diary:—"Saturday, April 16th, 1892. Altyre Wood, Forres.—Found one *Tephrosia biundularia* (?), and one banded *Lobophora lobulata*, resting on fir trunks. The ground was covered with snow." [The specimen has since been determined as *T. bistortata*, vide, *Ent. Rec.*, ix., p. 93].—A. HORNE.

The only other facts relating to Scotch specimens of *T. bistortata* are the references to Mr. Adkin's Altyre specimen (*Ent. Rec.*, ix., p. 29), Doubleday's and Smallwood's references to the species (*Ibid.*, pp. 28-29), my own experiences of breeding the species (*Ibid.*, p. 29), and Mr. Prout's references (*Ibid.*, vol. viii., p. 78). As Dr. Chapman regularly obtained *T. bistortata* at Ardentinnie, I consider it more than probable that specimens taken by Mr. Douglas Walker, at Lochgoilhead, were of the same species. There is as yet no shred of evidence that *T. crepuscularia* (*biundularia*) has, up to the present, ever been found in Scotland, though there appears to be no possible reason why it should not be found there.—J. W. TUTT.

SCIENTIFIC NOTES AND OBSERVATIONS.

APHOMIA SOCIELLA IN THE NEST OF VESPA SYLVESTRIS.—In continuation of a short paper I sent last year (vol. viii., pp. 182-183) with reference to the wax moth, *Aphomia colonella* (*sociella*), I found a small nest of *Vespa sylvestris*, the size of a cricket ball, suspended from the root of a tree in a bank almost visible through the grass. The wasps had just left it, and the whole was spun up into a hard mass. I kept it in my vivarium all the winter, and in the spring I found it very damp and mouldy, and was nearly inclined to throw it away. In the beginning

of July no less than 28 moths emerged, many of which had the beautiful green tinge. It was wonderful how they could force their way through the solid mass, and several were damaged about the head in consequence.—W. H. Tuck, M.A., Tostock House, Bury St. Edmunds.

PUPA OF *TROCHILIUM APIFORME* DRIVEN FROM ITS COCOON.—I took a pupa of *Trochilium apiforme* freshly turned, being of a whitish colour. This pupa was protruding from a hole in a poplar. After very carefully extracting it, there followed immediately two woodlice, which, no doubt, having irritated the pupa from behind, had caused it to proceed forward as far as it could go without actually falling out; for I imagine the habit of this pupa is not to protrude itself until ready to emerge.—C. BINGHAM NEWLAND, Killetra, Mallow.

ASSEMBLING OF *SATURNIA PAVONIA*.—On May 17th, a female of *Saturnia pavonia* emerged, and, though under cover, attracted males for three days, the said males never appearing before 2 p.m., but coming every day to a minute. *S. pavonia* is found on the moors some two or three miles from my house, but to my knowledge nowhere nearer. This female paired on May 20th, depositing ova before sunset. A small portion hatched on June 12th.—IBID.

CLEORA LICHENARIA TWO YEARS IN PUPA.—A specimen of *C. lichenaria* ♂ appeared in the breeding cage during June, which must have been taken as a pupa in 1896.—IBID.

PTINUS BRUNNEUS, DUFT., CAPTURED IN SURREY.—On May 23rd, 1892, I took, by sifting dead leaves on Purley Downs, a *Ptinus*, which, as I had some difficulty in identifying it, I submitted to several coleopterists. The Rev. Canon Fowler told me he thought it was *P. brunneus*, but eventually I put it into my cabinet as *P. subpilosus*, Müll. The Rev. H. S. Gorham has now kindly named it for me, and he tells me it is undoubtedly *Ptinus brunneus*, Duft. I therefore take this opportunity to record it. Of this insect, Canon Fowler says, in his *Coleoptera of the British Isles*: "In old wood, etc., especially in warehouses; probably imported." In the last *Catalogue of British Coleoptera*, by D. Sharp, M.D., and W. W. Fowler, M.A., this insect is placed among the "Introduced species." I can only say I took it on the Downs, far away from any houses.—HORACE DONISTHORPE, F.Z.S., F.E.S.

VARIATION.

PARARGE MÆRA AB. OBSCURA, N. AB.—Among some insects taken by Dr. Chapman at Aix-les-Bains during the first week in May, are some specimens of *P. mæra*, which differ considerably from those I have captured in various localities. The males are rather below the average size, all the wings blackish-fuscous in colour, with a narrow fulvous ring round the ocellated apical spot of the fore-wings. There are very slight traces of two fulvous patches below this. The ocellated spots on the hind-wings with narrow fulvous margin. The two minute ocellated spots, one above and the other below the apical spot, very small.—J. W. TUTT.

BLACK ABERRATION OF *NEMEOPHILA PLANTAGINIS*.—I have read with pleasure your very interesting and instructive paper on *N. plantaginis*. In doing so I observed that you had never seen a specimen with black

hind-wings. I have one in my collection, bred from a larva found on Scotston Moor, near Aberdeen, which has the hind-wings solid velvety black—not smoky, a form that I have previously referred to. The fore-wings have one or two yellow blotches, but otherwise they are also black. It is a beauty! So far as I know, it is unique as a British specimen.—ARTHUR HORNE, Ugie Bank, Beaconsfield Place, Aberdeen. October 3rd, 1897.

ABERRATIONS OF *ZYGÆNA TRIFOLII*-MAJOR.—The following are notes on some of the forms of the July emergence of *Z. trifolii*, as observed in West Dorset. Roughly they appear to be divisible into three groups: (1) Those in which the red spots are small, well separated and well defined. (2) Those in which the two central spots coalesce and assume either a more or less rounded shape, or, after coalescence, become elongated and elbowed. (3) Those in which all the spots coalesce—*ab. confluens*. This latter group may be sub-divided as follows: (1) Those in which the basal and the outer spots are joined to the central by a thin streak of colour running a little below the costa. (2) Those in which the central area of the wing is occupied conflently by a bold irregular mass of colour, equal to at least one-third of the area of the wing. This sub-group is the most beautiful as regards colour distribution, as well as the most rare. As regards the hind-wings, a form more or less orange-tinted occurs. This I have taken in perfectly fresh condition, and the colour is therefore not due to prolonged exposure (worn specimens have a strong tendency to become yellowish-red). The margin varies in depth, a few specimens have it not exceeding in depth that of some *Z. filipendulæ*, while others possess one deep and dark, forming a richer contrast to the main coloration than that of any other of our native variety. The females are excellently disposed to part with their ova; most of them when boxed deposited considerable batches, one of which I had great pleasure in forwarding to our editor for his critical examination.—J. CLARKE, Reading.

GRAMMISIA TRIGRAMMICA AB. OBSCURA, Tutt.—I have taken this season, in this neighbourhood, two very fine specimens of *G. trigrammica* *ab. obscura*, Tutt.—W. E. BUTLER, Hayling House, Reading.

NEMEOPHILA PLANTAGINIS AB. HOSPITA IN WESTMORELAND.—Whilst collecting *Erebia epiphron*, on a mountain near Helvellyn, in June last, I took, amongst a rather long series of *N. plantaginis*, a few nice specimens of the white form (*ab. hospita*). Both forms were taken together, and at an elevation of about 2,000 feet.—B. H. CRABTREE, F.E.S., The Acacias, Levenshulme, Manchester.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

DESCRIPTIONS OF EGGS OF LEPIDOPTERA.—*Erebia neoridas*.—The egg is laid on end, is somewhat oval in outline vertically, with a flat base and not very rounded apical area, the base being, however, broader than the apex. It is, when fresh laid, of a very pale yellow colour, with 16 strongly defined longitudinal ribs, strikingly white and shiny, reaching from the base to the shoulder of the egg, where they end in minute white knobs, united transversely by fine white concave threads. The apex of the egg is only slightly rounded, and is covered with a polygonal (hexagonal) reticulation. At the centre of each hexagon is a raised white knob, which gives off from its apex six concave radiating

threads, one to each of the angular points of its surrounding hexagon, which are also somewhat raised. These divide the polygonal reticulation into a secondary triangular reticulation. The white knobs (placed centrally in the hexagons) are arranged in four concentric rings, and extend, roughly, in lines, from the longitudinal ribs towards the apex of the egg, becoming smaller as they approach the apex. This white reticulation stops short at the micropylar area, which forms a clear yellowish depression, exceedingly finely reticulated. There are 35 shiny white transverse ribs between the base and the shoulder of the egg, well marked in the depressions, but almost obsolete on the summits of the longitudinal ribs. After three or four days the egg becomes irregularly mottled with small purplish spots and blotches, and the ribs (both longitudinal and transverse) are strikingly prominent and very shiny: the micropylar area is still yellow, and looks like a tiny star with three radii united by numerous fine concentric rings running round the central point. [Eggs laid on August 18th, on sides of a box, by a ♀ captured at Susa; rough description of newly-laid egg made same day, full description under a two-thirds lens on August 23rd.] On August 15th, I observed of an egg laid by a ♀ captured some three or four days previously, at Susa, that it was "rather more rounded at the apex than that of *Erebia tyndarus*, but otherwise of almost exactly the same shape, and with a marked blunt cylindrical peduncle forming the base of attachment." Although I examined some six or eight different eggs of this species afterwards, I found no other with this marked pedunculated base. The egg must therefore have been aberrant in this particular.

Erebia aethiops.—Of a pale yellow colour when laid, roughly spherical in shape, the shell rather dull in appearance, with 22 fine but very distinctly developed longitudinal ribs running from base to the micropyle, which is not quite at the summit of the egg examined, the latter being turned slightly to one side. The longitudinal ribs are crossed by a large number of fine transverse ribs. The micropyle forms a central stella, with fine radiating lines extending from the central point of a shallow depression, which is bounded by the termini of the longitudinal ribs. [Description made on August 13th, under a two-thirds lens used as a hand lens, from an egg laid in a box by a ♀ captured at Susa the preceding day.] Buckler says the egg is "glistening" in appearance, and has "about 30 longitudinal ribs."

Polyommatus corydon.—The egg forms a flattened disc with a quite flattened base, and viewed laterally has the outline of a flattened cheese with rounded edges. Viewed from above, there is nothing of which I can think that the egg so closely resembles as the well-grown blossom of a double dahlia. It is of a pale green colour. The micropyle forms a depressed area in the centre (at the apex), and is composed of rings of the very finest rounded cells, arranged concentrically. This area is of a rather darker green than the general colour. Around this, and over the greater part of the upper (and still somewhat depressed) area of the egg, the cells assume a rough quadrangular and polygonal (mostly pentagonal) form, arranged concentrically, and increasing in size from the micropylar area outwards, the edges of the cells being formed of fine raised silvery white lines. Outside this area, *i.e.*, covering the outer portion of the upper part of the egg and the sides, there are (viewed from above) five rings of squat pyra-

midal-shaped elevations of bright silvery-white colour, from the apex of each of which six (or seven) curved silvery lines run down, until they meet the similar curved lines coming from the adjacent elevations, so that, under a moderately high power, each of these lateral cells has separately the appearance of a central support with six concave radiating cables curving from the summit. There are three rings of these cells on the sides. The appearance of these raised points and their attachments is very remarkable and beautiful, and looks like the whitest spun glass or filigree silver. [The egg described was laid by a ♀ captured August 20th, at Aix-les-Bains, on the upper edge of her own left hind-wing, whilst in collecting-box. The description was made on August 22nd.] I believe this to be the first description ever made of the egg of this species. I could find none when writing my recent work, *British Butterflies*.

Linevitis sibylla.—Egg laid on the edge of the underside of a honeysuckle leaf. It is almost spherical in shape, pale yellowish towards the base and apex, and greenish towards the centre. The surface of the egg is very remarkable, being covered with deeply set hexagonal basins, with sharp prominent spiny points around their edges, and fine gossamer-like hairs extending therefrom. These basins and their appendages are transparent, sparkling like, and closely resembling in appearance, spun glass. The micropyle is situated quite at the apex, and consists of a minute black point situated at the bottom of a round, basin-like depression, the upper edge of which is composed of the sides of the hexagonal cells which surround it. The egg is a most beautiful object under the microscope. [Eggs received from the Rev. G. M. A. Hewett, July 10th, description made under a two-thirds lens, July 12th.] It is worth while to compare this description with the so-called descriptions of Newman and Rühl, which I fell back on in my *British Butterflies*. Entomologists might correct their copies accordingly.

Enodia dryas.—The egg is small for the size of the butterfly, being much less than the egg of *Erebia neoridas* or *E. aethiops*. The one described was pressed from the ovipositor of a specimen captured at Aix-les-Bains on August 20th. It is somewhat dome-shaped, rather more than three parts of a sphere, the base depressed and hollowed out (as in the egg of *E. hyperanthus*), and inclined to be a little pointed towards apex. The egg is of a very pale yellow colour, with the apical point tending to be transparent. The shell is very shiny and smooth, with scarcely a trace of either pitting or ribbing. [The description was made on August 24th under a two-thirds lens.]

Calligenia miniata.—Laid on sides of box, several close together, but not touching each other. Oval in outline. Height: width as about 5 : 3. Laid on end, and thus each one bears a somewhat superficial resemblance to a ninepin. The egg is yellow in colour, with an orange tint. The shell covered with roughly polygonal reticulation, the polygonal depressions being somewhat iridescent. The micropyle is placed at the apex of the egg, forming a central stellate structure, with twelve radiating points placed at the bottom of a very slight apical depression. Some of the eggs show considerable irregular depression towards the apex at one side, but this seems to be due to some external pressure. There is some variation in shape, some eggs being stumper than others, some also are placed less uprightly than others.

The apex of the egg is of a clearer and more transparent yellow than the other part. [Eggs received from the Rev. G. H. Raynor July 12th, description made the same day under a two-thirds lens.]

Leucania littoralis.—Eggs laid in rows attached to each other in folded edge of leaf of striped grass. The leaf is folded over just enough to hide and protect the eggs, and seems to be kept in position by a gummy silken secretion running along the outer edge of the row of eggs. The eggs might be almost spherical, but are pressed into different shapes by contact with each other and with the folded edge of the leaf. The normal Noctuid ribbing is absent, but the shell is covered with very marked polygonal reticulation, coarse towards the base, but finer towards the micropylar depression, which is just free of the point of attachment of the egg to its neighbour. The egg is at first pale yellow, then it becomes orange, then pitted with reddish, and, at last, slightly purplish, at which stage the shell itself is seen to be perfectly transparent, and the embryo may be observed within the egg-shell. The shell gives the most charming iridescent reflections. The micropyle consists of a number of polygonal cells, gradually decreasing in size until they reach the central point, which is slightly depressed. The eggs of this species are laid on their sides, although theoretically, no doubt, they may be considered as laid upon each other. [Eggs received from Mr. Bacot on July 8th, description made under two-thirds lens on July 12th.]—J. W. TUTT.

PRACTICAL HINTS.

Field Work for October and November.

By J. W. TUTT, F.E.S.

1.—The pupæ of *Amblyptilia acanthodactyla* are to be found in October and November, attached by the tail to the flower spike of *Stachys sylvatica*, between two of the whorls of seed-vessels, where they look like dried up flowers.

2.—*Ephippiphora gallicolana* may be reared from the galls of *Cynips terminalis*, collected in the autumn. It prefers those of the preceding year's growth.

3.—The larvæ of *Lithosia rubricollis* are in some years abundant, full-grown at the end of October, feeding on lichens and mosses growing on elm trees, and on walls near these trees.

4.—The larvæ of *Coccyx strobilella* feeds in the cones of spruce fir, which should be collected during the winter.

5.—The mines of *Lithocolletis andleridæ*, made in birch leaves, should be collected in October.

6.—The larvæ of *Noctua rhomboidea* make no objection to sliced potato as food during the winter. Many Agrotids will feed during the winter on carrots, buried in sand in a tub.

7.—The larvæ of *Coleophora virgaureella* should be collected in November from the seedheads of golden rod. They are easy to rear if kept exposed to the influence of the weather.

8.—In October and November the regular worker at ivy-bloom will probably get among hosts of commoner species—*Epunda lutulenta*, *Dasyampa rubiginæa* and *Camptogramma fluviala*.

9.—The larva of *Eupithecia arceuthata* feeds on wild juniper, from the end of September to the middle of November. It is seldom full-fed till the end of October (Crews).

10.—The pupa of *Eupithecia fraxinata* is to be found enclosed in a cocoon under moss, on the trunks of ash trees, from September until May.

NOTES ON COLLECTING, Etc.

STAUPROPUS FAGI AT READING.—*Staupropus fagi* was rather scarce here this year, the first, a ♂, occurred on May 3rd, two ♀s on May 11th. The latter commenced depositing ova the same evening (both batches fertile); one I gave to my old friend, the Rev. Canon B. Smith. The first larva hatched May 27th (I gave them special attention this year, as I had not had much success other seasons). They commenced pupating on July 7th; the first imago, a black ♂ (ab. *obscura*), emerged on July 27th, an ordinary ♀ on the 28th. I spoilt both trying to get them to pair, as I did several more, but without success (they all emerged between 9 p.m. and 12 p.m.). I had quite given it up with disgust, when, on August 4th, at 7.30 a.m., on looking into my cage, I was delighted to find a pair of the black ab. *obscura*, in cop. At 8.30 a.m. they were still paired, but by 9 a.m. had separated. The ♀ did not commence depositing until the evening of the 5th. The first larva emerged on the 13th; they were not out at 9 a.m., but by 12.30, eight were out. I should think I have quite 100, feeding well. The spring lot were sixteen days before they hatched, the second brood eight days. As I have got them out so early, I think I stand a very good chance of rearing them (I see Barrett says in his book, "a second generation has never been observed to feed up in this country," so, if that be so, I hope to beat the record). I have just received a letter from Rev. B. Smith, congratulating me on my success. He says he has bred a nice lot of imagines (from the eggs I sent him), but all the eggs from pairing these have proved infertile.—W. E. BUTLER, Hayling House, Oxford Road, Reading. September 22nd, 1897.

NOTES ON SPHINX CONVULVULI AND ACHERONTIA ATROPOS.—Last autumn was noted in East Anglia for the great abundance of two Sphingids in different stages—*Sphinx convulvuli* and *Acherontia atropos*. I saw as many as five of the former at one time, hovering over a bed of petunias in the September twilight—I may here say that the morning twilight, which lasts longer, is the better for observation—and the larvæ and pupæ of the latter were very abundant in West Suffolk and Cambridgeshire. But here the parallel ends: during the 50 years I have been a collector, I have never come across the larva of *S. convulvuli*, and I do not suppose that half-a-dozen entomologists have seen it alive in this country, although it is said to be not uncommon in parts of France and Germany, and no doubt the perfect insects easily fly over to our East coast. The converse holds good with *A. atropos*, as I have never seen the moth upon the wing, but I am informed that it is a strong flier, and might easily be mistaken for a bat. Last August I had many opportunities of seeing the larvæ and pupæ. In my village, upwards of 20 were found, nearly all upon patches of potato, and, in several cases, these patches were far away in fields where no potato crop had previously been. In one case, the

larvæ had left the potato patch and climbed over a low wall and pupated in a tuft of coarse grass in the next garden, but the majority were found when lifting the crop. It would be of interest to know the life-history of these two Sphingids, especially whether the females which migrate from the Continent in the spring—having been found at sea—only are fertile, and not the autumn brood. No doubt a *single* female produced all the larvæ and pupæ found in this village alluded to, an area of less than 1,000 acres.—W. H. TUCK, M.A., Tostock House, Bury St. Edmunds. Oct., 1897.

BREEDING *ACHERONTIA ATROPOS*.—I had a specimen of *Acherontia atropos* emerge on July 20th, 1897, from a pupa which had been kept, without a cocoon, in dry moss under a bell glass in an earthen pan, standing in another pan with water in it. The moth squeaked vigorously. Nine or ten *A. atropos* larvæ, which pupated successfully in earth in separate flower-pots, which were sunk in the ground out-of-doors, all died, though not taken out of their cocoons till after death.—F. NORGATE, 98, Queen's Road, Bury St. Edmunds.

PUPATION OF *COSSUS LIGNIPERDA* IN THE GROUND.—A friend, living in the New Forest, sends me the following interesting account, dated 1st July:—"I came across a 'Goat moth' the other day on my lawn, evidently newly emerged. About six inches off was the upper half of the freshly-vacated chrysalis standing perpendicularly. We pulled it out of the hole it was in, and, looking down, could see something at the bottom of the hole. On removing the turf, we found the cocoon lying in a horizontal position, and close to it a small piece of chrysalis." Is the fact of *C. ligniperda* pupating under ground known to naturalists? I have never heard of it myself, and always understood that the rotten wood in trees was the usual site, the larvæ using up the decayed wood to form the cocoon. This incident would account for the full-fed larvæ being occasionally seen wandering in the open.—C. BINGHAM NEWLAND, Killetra, Mallow. September 8th, 1897. [Vide, Tutt, *British Moths*, p. 339.—Ed.]

RESULT OF SPRING COLLECTING AND OBSERVATIONS IN CO. CORK.—The species taken at sugar during June, in this district, were as follows:—*Gonophora detersa*, *Thyatira batis*, *Phaenocarpa rumicis*, *Leucania comma*, *Aeglia putris*, *Xylophasia lithoxylea*, *X. polyodon*, *X. sublastris*, *Manestra persicariae*, *M. strigilis*, *Grammia trilinea*, *Caradrina cubicularis*, *Peridroma suffusa*, *Agrotis corticea*, *Tryphaena orbona*, *T. pronuba*, *Noctua plecta*, *N. e-nigron*, *N. triangulum*, *N. brunnea*, *Phlogophora meticulosa*, *Aplecta herbida*, *Hadena oleracea*, *H. pisi*, *H. thalassina*.—IBID.

MACROGLOSSA BOMBYLIFORMIS IN CO. CORK.—On May the 12th, I noted *M. bombyliformis* on low marshy ground, in which field scabious was plentiful, and also *Pedicularis sylvatica*, at the flowers of which *M. bombyliformis* was busily engaged, poisoning over them for a moment to extract the honey, and then flying away to another patch, but constantly returning. I could not observe more than one insect at a time, so that possibly it was always the same. These visitations occurred between 3 and 4 p.m., during the time the sun was out. When overcast, *M. bombyliformis* was conspicuous by its absence.—IBID.

PLUSIA MONETA NEAR ROCHESTER.—I have pleasure in recording the capture of a specimen of this rare species here, at light, on June 27th last. *Plusia iota* and *P. pulchrina* are both also moderately abundant.—(MISS) CLARA E. PYE, Knight's Place, Rochester. September, 1897.

ACHERONTIA ATROPOS IN CENTRAL FRANCE.—We have recently had a couple of imagines of *A. atropos* brought to us, neither perfect. Both sang most melodiously before being killed. The appearance of the imago in September suggests that, in this neighbourhood, at any rate, an autumnal emergence of the species in nature is not uncommon.—EDWARD S. HARRISON, Josnes, Loir-et-Cher. *Sept. 29th, 1897.*

BREEDING ACHERONTIA ATROPOS.—Out of 13 pupæ of *Acherontia atropos*, which I had in my possession, I only succeeded in rearing three moths, and, rather singularly, the three emerged, and were in the breeding-cage together, on the same day, *viz.*, July 26th. I have never had worse luck. At one time I was led to believe that the squeaking, or clicking sound made by this insect, was of uncommon occurrence. The reverse is my experience. I have from time to time had a fair number of this Sphinx—larva, pupa and imago—and nearly all the moths have, whilst being chloroformed, squeaked loudly, and fancy has detected or suggested a melancholy note of protest in their cries against their impending fate. I have also found the sound not infrequent in the larval and pupal stages.—JOSEPH ANDERSON, JUN., Chichester.

SPHINX CONVULVULI AT CHICHESTER.—A specimen of *Sphinx convulvuli* (worn) was captured in a garden here on September 3rd. The captor was a kitten. It is strange how frequently this moth falls into the clutches of the "harmless necessary," *Felis domesticus*.—IBID.

NOTES FROM TUDDENHAM.—I arrived at Mildenhall on Monday, June 21st, and went direct to the collecting grounds. There had been sunshine in the morning, but it had clouded over. However, I managed to kick up two *Agrophila trabealis*, and a few *Acidalia rubiginata*. In the evening, by "dusking" over *Silene otites*, I secured four ♀ *Dianthoeicia irregularis*, all very fair, and one in bred condition. Tuesday was dull till past 11 o'clock, and there was nothing doing; but when the sun broke through towards noon, *A. trabealis* was to be had in numbers, mostly in grand condition; also one fresh specimen of *Heliothis dipsacea*. I also kicked up a few *Lithostege griseata* among the poppies; it appeared to be only just emerging, as none had been seen in the same spot the previous day. Wednesday added further specimens of the same species, but nothing new except a couple of somewhat worn specimens of *Spilodes sticticalis*.—L. B. PROUT, F.F.S. [Extract from report of Nth. London Nat. Hist. Society.]

LEUCANIA EXTRANEA.—As this insect appears to be of rare occurrence, perhaps it is worth recording that I captured a good specimen, in Carnarvonshire on August 28th last.—GEO. O. DAY, Paris Bank House, Knutsford. *Oct. 1st, 1897.*

DEILEPHILA GALII.—I took a full-fed larva of this species on the Carnarvonshire coast on August 26th.—GEO. O. DAY, Knutsford.

NOTES FROM DOVER.—I took *Aporia crataegi* again this year (on Jubilee Day), but am sorry to say that they were much scarcer than last year. They also appeared to be more widely distributed, and not so extremely local as last year. I was, however, unsuccessful in my search for larvæ, the hawthorn hedge, where I expected to obtain them, having been cut down, and my search of other hedges proved fruitless. I may add that I have not seen *Colias edusa* this year, but a specimen of *Acherontia atropos* was captured a few days ago on a stack of bricks.—H. DOUGLAS STOCKWELL, 2, Albert Road, Dover. *October 1st, 1897.*

COLIAS EDUSA AND *PYRAMEIS CARDUI*.—As the occurrence of these uncertain species is always worth recording, I should like to state that I saw a single specimen of each of these species at Sherringham, near Cromer, during the second week of August.—(Mrs.) ROSA E. PAGE, B.A., 25, Casella Road, New Cross, S.E.

NOTES FROM THE YORK DISTRICT.—The season at York has been fairly good, considering the amount of collecting I have been able to do. I made one or two visits to the salallows with Mr. G. C. Dennis, in the hope of obtaining *Pachnobia leucographa*, but our anticipations were not fulfilled, for we had not the pleasure of making its acquaintance; scarcely a moth of any description was to be seen. This was somewhat disappointing, believing as we did that the moths were there, but the uncertainty of flight is always a matter to be reckoned with; some nights moths are swarming at the salallows, the following night, equally favourable in the eyes of the collector, although the moths appear to have a different opinion, for they are absent, and I am afraid the reason "why" will never be unravelled. At home, however, I had the pleasure of breeding a long series of *P. leucographa*, from ova obtained the previous season. I also bred a number of *Taeniocampa populeti*, also obtained thus, and amongst them were darker specimens than I had ever bred before, approaching the dark forms of *Taeniocampa instabilis*. During the first week of June, *T. populeti* larvæ were fairly common and full fed, and with them were a few larvæ of *Tetha subtusa*. Larvæ of *Hybernica defoliaria* and *Phiyalia pilosaria* were plentiful. On June 10th, Mr. S. Walker and I made our first visit to Askham Bog, where sugar was fairly productive, several *Acrionicta leporina*, *Apamea unanimitis* and *Hadena suasa* occurring, the two latter species more common than in previous years. One *Choerocampa elpenor*, a few *Leucania impudens*, and others, also appeared, but *Phibalapteryx vittata* was not so plentiful as in 1896. Two days after this we made a second visit, but there was little to be seen, and nothing worth recording. We did not visit the Bog again until the 26th of the same month, when we found sugar very attractive and moths absolutely swarming, and there was more variation than we had ever noticed before. *Agrotis exclamationis*, of course, took the prize in point of numbers, but certainly there were some nice forms amongst them, and we obtained a few nice aberrations, some in which the reniform and orbicular united together and formed a longitudinal dark streak. Thirty-two species of Noctuids were observed, and as many as 70 or 80 moths noticed on one patch of sugar, battling and struggling in order to partake of the banquet prepared for them, amongst them being *A. leporina*, *H. suasa*, *Caradrina morpheus*, *A. unanimitis*, *Xylophasia sublustris*, *Agrotis nigricans*, *Noctua rubi*—nice red forms—*Cerigo matura*, and many others. It was certainly gratifying to examine these patches of life, although the species were common, with the anticipation always present of finding something unique in the way of variety. Other nights proved equally attractive; I took a beautiful yellow form of *N. rubi*. Day collecting in the early months was not very productive. *Tephrosia crepuscularia* (*biundularia*) was somewhat scarcer than usual, but I bred a very long and variable series of this species; the variation, extending from dark to light, was very great, many fine mottled forms were amongst them, different from any I have noticed before. *Abraaxas ulmata* this season was, I think,

more common than usual, and the variation remarkable. I have collected this insect for many years, and seen it in thousands, but I have never taken what might be really called a good aberration; but this season it varied from dark blue or slate colour to almost white, besides bone-coloured specimens (in varying shades) and several banded forms. A great majority of the aberrations (especially the dark ones) were cripples, many of them with only two wings, and all the bodies black, which evidently points to some tendency to disease, due probably to mal-nutrition, and possibly may not occur again to the same extent, although odd specimens have, I believe, been previously taken of the dark form. I made one morning visit to the habitat of *Epione parallelaria* in July, and found the males flying fairly commonly at the usual time, from 6 a.m. to 9 a.m., the females, of course, absent.—R. DUTTON, Fishergate, York. *October 4th, 1897.*

PERONEA PERMUTANA ON BARNES COMMON.—In reply to Mr. Tutt's enquiry, this insect was most abundant on Barnes Common, about the year 1851. I took it myself, also Messrs. Shepherd, Grant, and a number of other entomologists, working there about that time; it then disappeared. It frequented the wild rose, *Rosa spinosissima*, I think it was. In a few years time I suppose entomologists will begin to doubt the lepidoptera once captured in Hammersmith marshes, now covered with houses.—SAMUEL STEVENS, F.L.S., F.E.S., Loanda, 61, Beulah Hill, Upper Norwood. *Sept. 23rd, 1897.* [Our query was simply based on the fact that, comparatively recently, specimens of an aberration of *P. variegana* from this locality, had been exhibited as *P. permutana*.—ED.]

PIERIS DAPLIDICE AT DOVER.—On the 27th of August last, while my son was taking *Polyommatus bellargus*, he came across a female Bath White (*Pieris daplidice*), at Diggles Tower Bank. I have shown this specimen to Mr. Sydney Webb, Dover.—A. STACEY, 84, Clarendon Street, Dover.—*Sept. 4th, 1897.* [We would suggest to our correspondent that the specimen should be exhibited at one of the London Entomological Societies. In our opinion the record of occasional and rare visitors should always be supported by the exhibition of the specimens.—ED.]

SPHINX CONVULVULI AT CARLISLE.—A specimen of this moth was brought to me to-day, which had been taken by a lady near the town. My friend, Mr. Robert Leighton, found one at rest on a wall in the yard of a large cotton mill, in Carlisle, on August 27th, and I heard of a third specimen being captured by another entomologist.—F. H. DAY, 6, Currock Terrace, Carlisle. *August 31st, 1897.*

NOTES FROM WYRE FOREST.—A run with the Woolhope Club, on August 27th, in Wyre Forest, afforded mines of *Lithocolletis distentella*, which appeared to be the most frequent species there on oak. Galleries of *Nephopteryx hostilis* were also seen. About the same time, cocoons of *Cerura bicuspis* were found in the Golden Valley, where *Cassida murroea* was also taken.—T. A. CHAPMAN, M.D., F.E.S., Redhill. *September, 1897.*

NOTES FROM SHERE, NEAR DORKING.—A party of the members of the North London Entomological Society visited this district on August 2nd, 1897, arriving at Gomshall about 1 p.m., and proceeding at once to Shere. The first insect observed was a male *Gonepteryx rhamni*, but after passing through the village of Shere, we turned towards the chalk

hills, and here observed *Polyommatus icarus*, *P. corydon*, *Epinephele tithonus* and *Pararge megaera*; whilst on the lower slopes of the Downs *Pamphila comma* was taken in considerable numbers, together with *P. corydon*, *Chrysophanus phlaeas*, *Gonepteryx rhamni* and *Thecla w-album*.—LAWRENCE J. TREMAYNE.

REVIEWS AND NOTICES OF BOOKS.

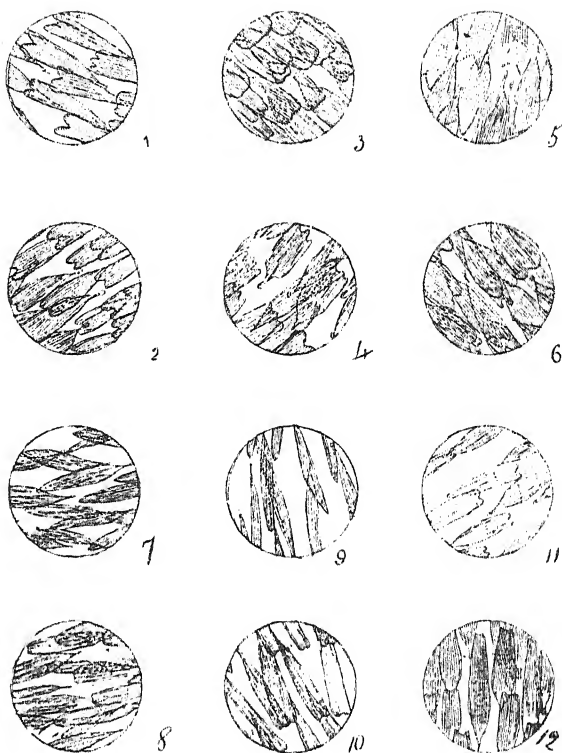
FAUNE DE FRANCE (ORTHOPTÈRES, NEUROPTÈRES, HYMÉNOPTÈRES, LÉPIDOPTÈRES, HÉMIPTÈRES, DIPTÈRES, APHANIPTÈRES, THYSANOPTÈRES, RHIPAPTÈRES), by A. Acloque. [Published by J. B. Baillière et Fils, Paris. Crown 8vo., 516pp. and 1235 figures. Price 10 francs.]—We have no hesitation in asserting that this work contains the largest amount of descriptive entomology ever published for the money. The summarised tables are simply marvellous. The book is intended to help entomologists to name their captures, and will no doubt fulfil this intention.

Obituary.

JOHN FINLAY, Born August 24th, 1835, Died July 4th, 1897.

It is with the greatest regret that we have to inform our readers of the death of Mr. John Finlay, at the age of 61 years. Commencing life with the meagre education to be obtained at a village school at the time of his boyhood, he took every means to supplement the knowledge there obtained in later life. For more than thirty years the beautiful gardens at Meldon Park have been his care and delight, and, for some years, botany was his special study. Later, however, he turned his attention to entomology, and not only was he very successful in adding information to the life-histories and habits of many of the larger species of lepidoptera, notably *Plusia bractea*, but many of the smaller insects were successfully studied by him, and he obtained large numbers of many hitherto-considered rare species, and distributed them with a generosity rarely equalled. His modesty was such, however, that he could not often be persuaded to publish his observations, but such information as he had gathered was at the disposal of any one who asked for it. We ourselves owe much to him, and regret his loss exceedingly, and so, we have no doubt, will many of our readers. His collection is, we believe, an exceedingly good one, and we understand that it was his wish that it should be disposed of privately. Will not some large northern town purchase it for museum purposes? Its value is undoubtedly very great as exhibiting the distribution of the local fauna of his own district, and it would be much more valuable if it could be kept intact for local reference than if it were broken up and distributed. We can only express again our regret at the loss of one of our earliest entomological correspondents, and treasure the memory of a man who, although an excellent lepidopterist, was first and foremost one of Nature's gentlemen.

ERRATUM.—p. 207, line 4, for "Mr. Butler" read "Mr. Clarke"; p. 196, in title, for "structural" read "structural"; p. 240, line 11, for "ragwort" read "mugwort"; p. 105, lines 9 and 39.—Mr. Fletcher points out that the statements in these quotations are wrong as to facts. He has not obtained hybrid *trifolii-filipendulae*. A correct list of the hybrids that he has obtained is published *ante*, p. 88.—Ed.



THE SCALES OF EUROPEAN ZYGENIDEN.

The Entomologist's Record AND

JOURNAL OF VARIATION.

VOL. IX. No. 11.

NOVEMBER 15TH, 1897.

On the scales of European *Zygaenides* (*Illustrated by Plate*).

By E. W. WAKE BOWELL.

By the kindness of Mr. Tutt, I have recently been enabled to make microscopic preparations of a fairly representative series of European *Zygaenidae*. The subject has proved of greater interest than I should have surmised, owing to the fact that this family presents us with examples of a regularly ascending series of scale forms, from the simple oval to the more complicated forms found usually in highly developed species. The scales, further, seem to afford a means of discriminating between closely allied species. It must be understood that the remarks concerning descent which follow are based solely upon the characters of the scales; not that I propose to found any classification upon what is probably only a secondary character, but the conclusions arrived at from a study of the scales may probably be confirmed by more general reasoning, and even if not, the comparison may be interesting. The family includes the genera *Ino*, *Aglaope*, and *Zygaena*. In *Ino*, the scales are generally small, scantily distributed and rarely bifid. As usual, the scales of the lower wings are less highly specialised than those of the upper. *Ino chloros* seems the simplest, both upper and lower wing scales being plain, "strap-shaped." *I. tenuicornis*, *I. pruni* and *I. chrysocephala* form a middle group, with the scales of the lower wings, simple, of the upper, bifid. *I. budensis* is a curious form, having the lower scales exceedingly small, whilst the upper ones have their ends decorated with a number of small points (*viz.*, the ends of the columns separated by the striae). This is visible in the other species, though to a much smaller extent. It appears to be a kind of degeneration, for the divided ends of other *Zygaenid* scales are composed of groups of columns, not of separate individuals. *I. ampelophaga* is the most highly developed of the species which I have observed (lower bifid, upper trifid, occasionally even quadrid). This would appear to be a case of parallel development to that which obtains in *Zygaena*; and on a smaller scale we note that *I. tenuicornis* seems to bear the same relation to *I. pruni* that *Z. trifolii* does to *Z. lonicerae*.

In *Aglaope* all the scales are *strap-shaped*, very long, and with parallel sides. Similar scales are to be found in some of the genus *Ino*, and they may especially be compared with those of *I. chloros*, which, although unlike them in many respects, retain the character of

parallel sides. This is generally lost in *Zygæna*, though the *minos* group presents some similarity in general appearance.

Coming to *Zygæna*, we note that *Z. ephialtes* with its various forms, and *Z. larandulæ*, form a group quite distinct from the remainder. Though scales of most of the primitive types are to be found on their wings, the predominant forms are sufficiently distinct, and *there is no difference between the scales of the upper and lower wings*. *Z. melusa* is a kind of connecting-link between these and the normal *Zygænas*, there being a slight difference in form between the two sets of scales. It should be understood that in all cases the *brilliant* red scales are rounded at the tips, and the amount of rotundity seems to determine the brightness of the general appearance. The duller red or orange scales are bifid or trifid, but not generally so markedly as the last mentioned. The colouring matter of these scales has not, so far as I know, been examined chemically,* but it certainly is, to judge from its optical properties, quite different from the ordinary reds (e.g., the red of *Pyrameis atalanta*). It also occurs in some Aretiid moths, and in many tropical butterflies, especially those with wings for the most part transparent, belonging to various genera. The Sesiids also, so far as I have been able to judge from a few fragmentary specimens, seem to have the same colour in their red scales. *En passant*, I may remark that *Zygæna* scales are very suggestive of *Rhopalocera*; but to illustrate this point properly would certainly require a greater area of illustrations than Mr. Tutt can be expected to grant for the present.

The middle group of *Zygænae*, containing our species, *Z. filipendulæ*, *Z. trifolii* and *Z. loniceræ*, together with a great number of Continental species and aberrations, is (generally) characterised by having the scales of the lower wing more attenuated than those of the upper; the former are generally bifid, the latter bifid or trifid. But there is very great variation in these species; in fact, the genius of change seems to run riot amongst them. It is very possible, however, that an examination of more material may reveal system even here, and particularly it seems likely that there is a section containing five-spotted, and another comprising six-spotted, species; though it appears probable that some of the five-spotted insects have been produced (by reversion?) from six-spotted forms. There are undoubted traces of species in the process of manufacture, e.g., *Z. athamanthæ* (*peucedani* ab.) has extended its aberration to the form of its scales. Another suggestion, which probably has more in it, is, that one section has broad borders to the lower wings, and another, thin and distinct borders. Our three English species are sufficiently distinct (see figs.), *filipendulæ* being perhaps the most fixed and typical of the whole group, whilst the external resemblance of *trifolii* and *loniceræ* is not maintained in the scales. *Z. hilaris* and *sarpedon*, with their very peculiar triangular scales, may be an offshoot from this central *Zygænid* type; or, as appears more likely, *sarpedon* may be the parallel to *hilaris* in our third group, to which *lacta* unmistakably belongs.

Z. meliloti seems to form a connecting link between the "central *Zygæna*" and the aforesaid third group; but its affinities seem rather with the latter.

This same third group comprises *Z. minos* and its allies, and is far

* Vide, *British Noctuae and their Varieties*, Vol. ii., p. xi.—Ed.

nearer to the original Zygænid type than either of those previously described. Its scaling is not much unlike that of *Ino*, but *Ino* itself has in some instances advanced beyond it. The scales are long ovals, more or less sparsely planted, and rarely bifid, though there is a *tendency* that way in several species. It will be observed that whenever these scales suggest a triangular shape, the base of the triangle is towards the base of the scale, whereas in the higher *Zygaenæ* the reverse is the case (and generally, indeed, their scales are oblong rather than triangular). This is an additional reason for referring *meliloti* to this group (c. f. figs. 7 and 12). There is a certain amount of difference (perhaps due to long isolation in different localities) between Mr. Tutt's continental *Z. minos* (figs. 9, 10) and my own Irish specimens (figs. 7, 8).

The method employed has been simply to mount portions of the wings of dry specimens in Canada balsam, using a rather thin (but not too thin) solution. The balsam will permeate well enough on pressing the cover-glass, or it may be assisted by *gentle* heating over a spirit lamp. A few bubbles, however, are not deleterious, so long as they do not obscure anything that one wants to see. Specimens possessing at least one upper and one lower wing will do, though it is advisable that they be not much worn. The chief thing to guard against, however, is folded and curled scales—these occur in specimens which have not emerged satisfactorily. I shall be glad of assistance in local British forms, some of which may prove of interest; also of any Continental specimens with reliable data. Mr. Tutt will take charge of any odds and ends for me.

DESCRIPTION OF PLATE.—Fig. 1—Scales of *Zygaena lonicerae*, lower wing. Fig. 2—Scales of *Z. lonicerae*, upper wing. Fig. 3—Scales of *Z. trifolii*, lower wing. Fig. 4—Scales of *Z. trifolii*, upper wing. Fig. 5—Scales of *Z. jilipendulæ*, lower wing. Fig. 6—Scales of *Z. jilipendulæ*, upper wing. Fig. 7—Scales of *Z. minos* (Irish), lower wing. Fig. 8—Scales of *Z. minos* (Irish), upper wing. Fig. 9—Scales of *Z. minos* (Continental), lower wing. Fig. 10—Scales of *Z. minos* (Continental), upper wing. Fig. 11—Scales of *Z. meliloti*, lower wing. Fig. 12—Scales of *Z. meliloti*, upper wing.

Note on the illustrations.—These have been sketched with an Abbe drawing camera. The striae are *not* works of the imagination, but the cross striations have been left out, except in one scale, in fig. 12, because it was found impossible to get them in satisfactorily by this method. These "cross striations" occur principally on the scales which have a metallic aspect. All the figures are of the same magnification, *viz.*, $\times 480$ diam. [They have been reduced $\frac{1}{3}$ in making the plate.—Ed.]

The fluctuation in numbers of Sedentary Species of Lepidoptera, with some Criticisms suggested by the List recently issued by the Protection Committee.

By JOHN BULL.

Apart from the periodic abundance in this country of certain species of Lepidoptera of undoubted migrating tendency, such as *Colias hyale*, *C. edusa*, *Pyramis cardui*, *Sphinx convoluti*, *Deilephila galii*,

Diopcia pulchella, *Plusia gamma*, etc., there is sufficient evidence to show that certain sedentary species have fluctuating periods of scarcity and abundance. Mr. Adkin (*Entom.*, xxx., pp. 232-233) gives an example of this in *Clisiocampa castrensis*, which, in some seasons, is comparatively rare, and in others occurs in the greatest profusion, and yet, on the whole, is probably as abundant now as it ever has been in this country. He further gives another example in *Porthesia chrysorrhoea*, which, after appearing in the greatest abundance for some years, 1871-1875, in various parts of Kent, became so rare that for 20 years a few single imagines comprise the sole records for the county. Now, after such a long disappearance, Mr. J. J. Walker records the webs of the gregarious larvæ as not uncommon in one of its old haunts near Sheerness.

It is quite evident that such insects as these fluctuate in this way, quite independently of any influence that the collector of Lepidoptera exerts, and that such species have not suffered, and do not suffer, from the depredations of collectors. as have *Lycaena arion*, *Melitaea cinxia*, *M. athalia*, *Apatura iris*, *Nola albitalis*, etc., in certain localities. It is well known that vast numbers of certain species—*Dryas paphia*, *Limnitis sibylla*, *Catocala promissa*, *C. sponsa*, in the New Forest; *Phorodesma smaragdaria*, on the Essex coast; *Epione parallelaria* (*respertaria*), at Askham Bog; *Sesia chrysidiformis*, at Folkestone—are taken by a certain small bevy of professional and so-called amateur collectors, and, however much one may deplore this fact, it cannot be contended that these species show, taking one year with another, any very great diminution in number in these localities, nor can it be urged that these species require protection “to save them from extermination.” It is different, however, in some of the restricted haunts of certain of these species elsewhere, e.g., in our south-eastern counties, where *D. paphia* and *L. sibylla* have been practically exterminated. Scarcely any of the woods in Essex, Kent, Surrey, Middlesex and Sussex, that used to produce these insects in abundance, do so now. Comment is superfluous.

Similarly, such species as *Leucophasia sinapis*, *Papilio machaon*, *Carterocephalus palaemon*, *Thymelicus actaeon*, *T. lincolni*, *Thecla pruni*, *T. w-album*, *Zephyrus betulae*, etc., which are captured to a specimen, so far as possible, for exchange and sale purposes, show no very decided falling off in numbers, that can be directly referred to as a result of the persecution, except in certain localities. In these latter localities, it appears necessary that the species should be protected, if they are to be saved from extermination, e.g., *Leucophasia sinapis* undoubtedly wants protecting in south and south-eastern Britain, yet there is not the slightest necessity for its protection in the western parts of the British Islands.

Incidentally one may note that the almost total disappearance of *Polygonia e-album* from Kent, in which county it was once very abundant, is certainly not due to collectors, and is possibly due to altered agricultural conditions. The disappearance of *Nola centomalis* from Deal was due to a philanthropist, who cleared the ground for tents, in which London's waifs and strays were housed during the summer months. The ground on which *Acidalia ochrata* abounded at Sandwich was levelled for golf, and the species practically exterminated there.

It is beside the question, perhaps, but the fluctuation in abundance of *Clisiocampa castrensis* appears to be on all fours with that of *P. c-album*, in the western counties of England, *Eugonia polychloros*, *Lithosia deplana*, *Ctenistis quadra*, *Gnophria rubricollis*, *Heterogenea cruciata* (*asella*), *Lophopteryx carmelita*, *Moma orion*, *Dicelya oo*, *Cidaria sagittata*, and numerous other undoubtedly sedentary species. These species occasionally occur in large numbers for a season, and then, owing to no reason that entomologists have yet been able to explain, have become very rare for a number of years, only to reappear at some future time in their old haunts in greater abundance than ever.

There is no doubt that many entomologists in this country would consider that this uncertainty in the appearance of these species is a *bona fide* reason for their protection, and they would urge that no outside factor should be allowed to increase the precarious position that such species hold in this country. Such a reason is, in my opinion, a good one for protecting such species as *Aporia crataegi*, *Laelia caenosa*, and perhaps *Porthesia chrysorrhoea*, should the two former still exist in this country, but I am not sure whether the abundance of any one of the "fluctuating" species, just enumerated, would be influenced the year following an exceptional abundance, even if no collecting of the species took place when it was abundant.

Classifying the list published by the Protection Committee (*ante*, p. 214), it appears to me to divide up as follows^o:—I. SPECIES THAT HAVE BECOME PRACTICALLY EXTINCT FROM UNKNOWN CAUSES—*Aporia crataegi*, *Porthesia chrysorrhoea*. II. SPECIES THAT HAVE BECOME MORE OR LESS RARE OWING TO OVER-COLLECTING IN MOST OF THEIR KNOWN HABITATS—*Melitaea cinxia*, *Lycaena arion*, *Nola albulalis*, *Cnaemidophorus rhododactylus*. III. SPECIES THAT HAVE BEEN MUCH OVER-COLLECTED LOCALLY—*Melitaea athalia*, *Apatura iris*, *Papilio machaon*, *Carterocephalus palaemon*, *Scoria dealbata*, *Zygæna meliloti*, *Plusia chryson*. IV. SPECIES THAT PROBABLY HAVE BEEN OVER-COLLECTED LOCALLY—*Leucophasia sinapis*, *Limenitis sibylla*, *Thecla pruni*, *Thymelicus actæon*, *Eulepia cribrum*, *Epione parallelaria*, *Filonia limbaria*, *Cidaria reticulata*. V. SPECIES CONCERNING WHICH THERE IS NO EVIDENCE TO PROVE THAT THEIR ABUNDANCE HAS BEEN LESSENED BY OVER-COLLECTING—*Trochilium scoliaeforme*, *Zygæna exulans*, *Nola centonalis*, *Lithostegia griseata*. VI. SPECIES THAT ARE PROBABLY AS ABUNDANT AS EVER, BUT FLUCTUATE IN NUMBERS FROM YEAR TO YEAR—*Nola strigula*, *Clisiocampa castrensis*, *Moma orion*, *Acosmetia caliginosa*, *Dianthoecia irregularis*. VII.—SPECIES THAT VERY FEW COLLECTORS KNOW ANYTHING ABOUT, AND NOT LIKELY TO BE OVER-COLLECTED—*Drepana harpyula*, *Agrotera nemoralis*. It is quite possible that some of these species want protecting locally, especially those classified under III. and IV., but I doubt whether all (or any) of these should be included in a list to be applied to the whole of the British Islands.

To show that the fluctuation in the abundance of Lepidoptera is not confined to the British Islands, I should like to quote a few notes made by Nicéville as to certain tropical insects. In tropical forests, one would expect to find the outside disturbance set up by man at a

* I would apologise here for using up-to-date nomenclature. It appears strange for such a go-ahead committee to be as far behind in its nomenclature, as it appears to be in its knowledge of the distribution, etc., of some of the British species.—J. B.

minimum, yet we find many tropical butterflies subject to very similar fluctuations to those exhibited by certain British species. We read (*Butts. of Sumatra*, p. 390) that *Elymnias laisidis*, a species whose larva feeds on bamboo, and which is usually "very rare," was "unusually abundant in Sumatra in 1892-1893, being seen almost in swarms," whilst the author adds that, "in India, the allied *E. timandra* has been noted in the Khasia Hills of Assam as occurring in thousands, in some years, in a similar manner." Again, in 1890, the normally "rare" *Cirrhochroa fasciata* was "unusually abundant at the Saentis Estate near the sea, where a flowering tree was daily covered, so long as the flowers lasted, with the species." We also read that, in December, 1892, and January, 1893, *Hippolimnas bolina* occurred "in large numbers, whilst the following year, as was usually the case, there was scarcely a single specimen to be seen." These cases seem to be almost on all fours with the occasional abundance of such species as *Moma orion*, *Dicycla oo*, *Oenistis quatra*, and other sedentary British species.

I do not wish to make more difficult the onerous task of the Protection Committee, which, I think, has been appointed none too soon. But if it is to have the support of all right-thinking entomologists, its conclusions must be logical, based on a wide knowledge, and be devoid of serious objection. It is a good sign, and indicative of work done, when *Lycaena arion* is not advertised by its name, but as a "rare southern insect." The moral influence exerted by the committee is evidently making itself felt, but it must walk "Airily! airily! oh, so warily!" as "comic opera" hath it.

***Asemum striatum*, L., a Southern Insect.**

By HORACE DONISTHORPE, F.Z.S., F.E.S.

I was interested to see, in the *Entomologist's Record* for August, that *Asemum striatum* was again taken in the New Forest, this time by Mr. C. Nicholson. Mr. Lawrence Tremayne then goes on to mention other specimens taken, but as the facts he mentions are not quite correct, I thought it would be as well to set the matter right. I, therefore, give a list of all the southern specimens taken up to date.

The first specimen was taken at Whitsuntide, in 1893, in the New Forest. Mr. Englehart and Mr. W. C. Jackson, of Bournemouth, were working together at a pine stump near Rhinefields, when a beetle was dug out, which Mr. Englehart secured, and it turned out to be *Asemum striatum*. Mr. Englehart, I believe, on his return to Denmark, gave the specimen to Mr. Rye. The Rev. H. S. Gorham took a specimen in Lord's Wood, Southampton, on May 10th, 1894, and recorded it in the *Entomologist*. Mr. F. Bouskell, of Leicester, took a specimen in the New Forest, at Whitsuntide, 1895. Mr. Bertram G. Rye captured two specimens from old pine stumps at Bookham, Surrey, in May, 1896, which are recorded in the *Entomologist's Monthly Magazine* for May, 1897. Mr. C. Nicholson captured a specimen at Lyndhurst, June 4th, 1897, which is recorded in the *Entomologist's Record* for August, 1897.

A description of the ova and larvæ of *T. bistortata*, *T. biundularia* and its var. *delamerensis*, and some further notes on their interbreeding.

(Concluded from p. 246).

By W. S. RIDING, B.A., M.D., F.E.S.

Mr. Hewett kindly sent me ova of *T. biundularia* and its var. *delamerensis*, from the York district. Those of *T. biundularia* were laid on May 14th, and hatched on June 3rd and 4th. They, too, are oval, with slightly broader base, smooth and pale yellowish-green. The average length of the long axis is .693 mm.; of the short axis .5 mm. I could find no constant difference in the structure and markings of the larvæ from those of *T. bistortata*. There is a similar great variation in intensity of colour and markings, but this brood seemed darker, as a whole, than the 1st brood of *T. bistortata*, and corresponded in this respect with the 2nd broods, especially that from captive parents. The average length of the larva is from 3.25 to 3.5 cm. (1" 3" to 1" 4"), very rarely 3.65 cm. (1" 5"). The period between hatching and pupation was 32 to 34 days (June 3-4th to July 5-7th). The ova of var. *delamerensis* hatched on May 30th and 31st, and the larvæ pupated from July 5th to 8th, a period of 36 to 39 days. All the larvæ previously described, as well as most of the var. *delamerensis*, were kept indoors under similar conditions. I sleeved a few dozen of the latter on oak, exposed to S.W., during the first few days of June, and as the weather was continuously fine and warm, there could not have been much difference in the conditions; but by June 29th I found they had fed sparingly, and were advanced only as far as stage 2. I removed them indoors and fed them on sawfly, as I did all the others. They fed up rapidly, and pupated between July 18th and 20th, a period of feeding of about 50 days. I cannot but attribute the difference mainly to the influence of the food. A description of the larvæ of var. *delamerensis* corresponds with that of *T. biundularia*—the brood as a whole was darker and with more intense markings than the 1st brood of *T. bistortata*. The length, when full grown, averaged 3.25 to 3.5 cm. (1" 3" to 1" 4").

The result of my observations in 1897 corresponds generally with that of 1896, except that, owing to the insects all emerging earlier, ova were deposited and hatched a month sooner this year. In response probably to this cause and a cooler summer, the period during which the larvæ fed was lengthened, and scarcely differed with any of the insects, extending from 45 to 60 days. Some ova of a Perth *T. bistortata*, for which I am indebted to Mr. Hewett, hatched on May 17th and 18th, 1897, and pupated June 16-23, a period of only 30 to 36 days, influenced probably by season and temperature. The hybrids fed up in 41 to 46 days. I found a similar difference in the size of the ova to that noticed in 1896—the larger size of those of *T. bistortata* (1st brood) seems a constant character, which has been corroborated by other observers. The ova of the 2nd brood are also somewhat larger than those of *T. biundularia*. The ova of the hybrids of the 1st generation followed the size of those of the ♀ parent, whilst the ova of the 2nd generation are smaller, showing a long axis of .649 mm. and a short one of .465 mm.; or approximately one may put the relative size in a proportion—ova of

T. bistortata (1st brood): ova of *T. bistortata* (2nd brood): ova of *T. bimundularia*: ova of hybrids, 2nd generation: : 4.25 : 3.75 : 3.5 : 3.

The ova of the Perth *T. bistortata* were of about the same dimensions as the largest Clevedon ova, *i.e.*, .785 mm. (long axis), and .556 mm. (short axis). Some of the differences of colour I described in the *Ent. Record*, vol. ix., p. 150. The ova of the Perth *T. bistortata* were a brighter green than those from Clevedon, and mottled in assuming the pale yellowish-green tint, a mottling I had not seen in any of the other ova. The ova of the 2nd generation of hybrids varied, some were deposited pale yellowish-green, others a brighter green with faint bluish tinge. I noted no other differences in the ova, either in shape or surface. The variation in colour and intensity of the markings of the larvæ was as great in all the broods as I found in 1896, but I ascertained that the deeper coloration and markings were not characteristic of the later broods as appeared last year, as they were prevalent in the early brood of *T. bistortata*, and were less developed in the brood of *T. bimundularia*, which showed a large proportion of pale putty-coloured larvæ. The Perth larvæ were full sized, and very strongly marked with dark brown, black and reddish, and presented very few of the paler forms. I examined the characteristic V marking of the Tephrosias in the 3rd stage, carefully, but cannot agree as to any constant difference existing in this mark. I find it varies from a complete V to almost obliteration at the apex, in every degree, in all the broods indiscriminately. I think, if the larvæ are examined in sufficient numbers, it will be found that none of the major markings show any constant difference. The size of the larvæ of the two Tephrosias did not appear to vary as much as in 1896, though the early brood of *T. bistortata* seemed somewhat larger on the average, a result probably connected with the length of the feeding period. The ova of the hybrids mentioned in the *Ent. Record*, vol. ix., p. 150, hatched April 21-29th. and the larvæ pupated between June 1st and 14th, except a few laggards. Some of the imagines began to emerge on June 11th, and have continued doing so to the present time (July 15th), but only sparingly the last few days. Between June 13th and 16th I paired the following hybrids:—
 ♂ *T. bistortata* + ♀ *T. ab. delamerensis*, ♂ *T. bistortata* + ♀ *T. bimundularia*, ♂ (♂ *T. bistortata* + ♀ *T. ab. delamerensis*) with ♀ (♂ *T. ab. delamerensis* + ♀ *T. bistortata*), ♂ (♂ *T. bimundularia* + ♀ *T. bistortata*) with ♀ (♂ *T. bistortata* + ♀ *T. bimundularia*), and ♂ (♂ *T. bistortata* + ♀ *T. bimundularia*) with ♀ (♂ *T. bimundularia* + ♀ *T. bistortata*), 12 pairings in all. Each yielded ova, except one pairing of ♂ *T. bistortata* + ♀ *T. ab. delamerensis*, which two I found in copulâ, and as they remained so over two days, forcibly separated them. The batches seemed to be a little smaller, for the most part, than those of the 1st generation, numbering between 100 and 200 ova. The ova were similar in shape and superficies to those already described, but smaller and variable in colour, as stated above. They are now hatching, some larvæ having appeared on July 1st. The characteristics of the hybrid imagines are—small size, 1" 2''' to 1" 5''', only two or three reach 1" 6''', and most are 1" 3''' or 1" 4''', and a blending of the facies of the parents in variable degrees, which renders definition impossible, except in those sprung on one side from var. *delamerensis*, which show a large proportion similar to,

though smaller than, that parent. The paler forms resemble mostly *T. biundularia* and the 2nd brood of *T. bistortata* (especially the ♂s). There is an approach only to the brown colour of *T. bistortata* (1st brood) in less than 8 %.

I think with Mr. Tutt, that little stress can be laid on the fertility of hybrids produced artificially from parents as closely related as these two, and we have no evidence of their pairing in a state of nature, though the possibility exists in other counties besides Yorkshire, where the times of emergence in the same district overlap. I cannot agree with Mr. Hewett, that *T. biundularia* is the original stock. It seems to me probable that *T. biundularia* branched off from a 2nd brood of *T. bistortata* at some comparatively recent period, and the distribution of the two insects over Continental and other areas tends to confirm this opinion.

On a collection of Spring Rhopalocera made in the Riviera, with some considerations concerning the hybernating stage of certain butterflies.

(Concluded from p. 255.)

By J. W. TUTT, F.E.S.

Euchloë euphenoides.—This species illustrates excellently the influence of an elevation of two to three thousand feet, on a species, even in the sunny south; for although Chapman found it abundant at Cannes, in March, it did not appear at Digne until towards the end of April. Millière observes that the species is not found in the plain, but only flies on the lower mountains, where *Biscutella luervigata* grows, and that the species is found commonly on the heights of Valauris, the last fortnight of April.

Euchloë cardamines.—One might almost suspect that this species is partly double-brooded in the south. It was in great abundance by April 16th, at Digne, this year, and getting worn on the 21st. Yet A. H. Jones took it rather commonly during the second and third weeks of June, in 1890. Oberthür records it from Canterets, in July, 1882 (*Lép. des Pyrénées*, p. 14), but I do not know the elevation of this place. The species lasts a long time in Britain, but there is only one brood.

Leucophasia sinapis.—Millière says this “flies commonly in May and in June, and has a second éclosion in August, which is less abundant than the first.” I am inclined to suspect that these May and June specimens, on the Riviera, are a second brood, since Chapman found the species quite abundant in March at Cannes. In 1893 there was only a period of six weeks between the first and second broods of this species in Britain. At Digne, in the middle of April, the first brood was already worn, and this was at an elevation of 2,000 feet.

Gonepteryx rhamni.—Of this species Millière writes:—“Éclot dès le mois de mars et vole pendant ceux d'avril et mai.” Now there can be little doubt that this species hybernates as with us, and has a summer (or autumn) brood, of which Millière says nothing. It swarms in the clover fields in southern France in July. Chapman says that the

species was "rare at Cannes in March, and all that were verified by capture were worn." I can confirm this as to the species at Digne in April. Blackmore, in 1869, found it "common in February" at Tangier, whilst Baker records *Rhodocera farinosa*, L. [possibly the summer brood of *G. rhamni*, which is known as *farinosa*, Zell. (not Linn.)], as being "rare at Guelma, in June." I suspect these would be the first appearances of the summer imagines. A. H. Jones found it out in June, 1890, at Digne. At any rate, Millière must be wrong in supposing that this species emerges in March. Chapman says that, on May 3rd, 1897, at Grenoble, "*G. rhamni* was abundant, but no *G. cleopatra* seen."

Gonepteryx cleopatra.—Although I have seen *G. cleopatra* in its native haunts, I would not like to say this species was distinct from *G. rhamni*; I think it probably is. Millière says: "This charming *Rhodocera* flies abundantly in April and May, in all places where *Rhamnus alaternus*, the only food-plant of the larva, grows." He adds: "*Cleopatra* re-appears in July, but the second generation is less abundant than the first." Is there a second generation? Chapman says: "*Cleopatra* is usually much fresher than *rhamni*." Those I was able to capture at Digne certainly looked as if they might have hybernated. Blackmore found it "common in February," with *G. rhamni*, in Tangier, in 1869. From want of good breeding experiments, the specific value and winter habits of this are as little known as any species in Europe. A. H. Jones found it "not uncommon in June," 1890, at Digne. Were these emergences of the summer brood?

Colias edusa.—The winter habits of this species were worked out somewhat elaborately (*Ent. Rec.*, vii., p. 250). The conclusion there arrived at was known to Millière in 1872, for he writes: "The caterpillar, which winters, pupates in April, etc." Baker found it already emerged in February, 1885, at Lambessa; Blackmore found it at the end of February, 1869, 20 miles south-west of Tangier. Chapman found freshly-emerged specimens in March at Cannes, and it was out by the middle of April this year at Digne; and during the first week of May, 1894, Jones found it fairly common at the same place. The next brood occurs in May and early June, at Guelma, in 1885 (Baker); at Digne in 1890 (A. H. Jones). This is presumably the brood that migrates. Bromilow reports (*E.M.M.*, xxix., p. 17) having observed a single example flying on the Promenade des Anglais, Nice, on December 1st, 1892. Eaton (*l. c.*, p. 43) records one on January 9th, 1893, at Algiers, which flew along as if it were laying eggs. Bromilow records another specimen at S. Maurice (north of Nice) on February 12th, 1893, whilst Bignell bred one in England on February 1st, 1893, from an egg laid September 16th, 1892.

C. hyale.—Millière does not say this hibernates as a larva, although there can be little doubt that this is so (*vide Ent. Rec.*, viii., p. 12). He says: "The caterpillar lives in June and September on the Coronillas." Freshly-emerged specimens were out in Cannes in March, and the species was quite abundant before the end of April at Digne. A. H. Jones also found it "extremely plentiful" there during the first week of May, 1894. The second brood is well out in the low-lying countries of the Mediterranean littoral at the end of June, but, at 3,000 to 5,000ft. elevation, the end of July and commencement of August is its average time of appearance.

Polygonia egea and *P. c-album*.—These two allies cover much the same ground in southern Europe, but the former keeps a much better colour during its hybernation than the latter. Millière says that *P. egea* “emerges in May, then in July, a third generation appearing in September.” This, I take it, is correct. The females were busy laying their eggs at Cannes in March, and at Digne in April, on the *Parietaria*, growing on the rocks forming the walls by the roadside. Jones took a larva of *P. egea* during the first week of May, 1894, and this produced an imago on June 4th. Rühl gives only two generations, May and June and September, but it is probable that Millière is right. Of *P. c-album*, which sometimes has three broods in England, Millière only allows two at Cannes, for he says: “It flies in June and in September,” but at Aix-les-Bains there is most distinctly an intermediate July brood. Millière gives as its food-plants, “l’orme et quelquefois sur le saule et le peuplier.” It would be interesting to know whether the French broods are more distinct as to the hybernating habit, or whether they follow the habit I have described in *Brit. Butts.*, p. 349, as occurring in each brood of our British individuals of this species.

Argynnis lathonia.—The larva of this species must feed up very rapidly after its hybernation in spring, in order to produce the first emergence. It appeared at Digne by the middle of April this year. Millière’s statement that “Elle a deux éclosions; mai et en septembre,” wants considerable modification for southern France. The first brood is well out in early April, and the second in middle July (early August in the Dauphiné mountains).

Brenthis dia.—Like the other Argynnids that winter as larvæ, this species also feeds up very rapidly in the spring. The first brood is very abundant in March and April, and the second brood in July and August.

Melitaea cinxia.—Like the last species, the larva of this insect must feed up very rapidly after hybernation to become so abundant in March and April. Millière says, “Très commune partout en avril, mai et juin,” but does not mention the very marked partial second brood, which occurs so generally in south-east and southern France in July and early August.

Coenonympha pamphilus.—The wintering habits of this species are well known. See Tutt, *Brit. Butts.*, pp. 423-424.

Erebia epistygne.—Millière says of this species:—“Parait sûr les hauteurs de Grasse une première fois en mars et une seconde en juillet.” Kane also repeats this as a fact, giving the months of appearance as “March and July,” and adds what is my experience, *viz.*, “flies but a very short time.” A. H. Jones, however, took worn specimens in the first week of May, 1894 (*B.M.N.*, vol. xxx., p. 176). The double-broodedness of an *Erebia* is so remarkable, that I looked up all available information. Rühl says:—“Fluggebiet: Alpen der Provence (Südfrankreich, März); Mittelspanien (März, April, Juli).” Mrs. Nicholls makes a strange record. She says (*Ent.*, xxiii., p. 78): “It was also too late for the local *Erebia epistygne*, which flies on the high limestone ridge of Les Dourbes during March and April,” but this statement is followed up with a list of captures made (between June 9th and July 2nd) in the neighbourhood of Digne, and here we find: “*Erebia eivas* and *E. epistygne* on the Dourbes.” Presumably, Mrs. Nicholls means to say that this species may be found there, not

that she took it there. Dr. Chapman and I were most anxious to get information on this point, when at Digne, and we questioned Monsieur Coulet, Senr., of Les Dourbes, most particularly as to this reported second brood. He insisted most strongly that the species only occurred once, and that there was not even an occasional odd specimen to represent a second brood. It will be interesting to learn how this species winters. From the information to be obtained, one might suppose this insect first appeared in April. Nicholson (*R.M.M.*, xxviii., p. 272) mentions the "middle of April," but although worn specimens may be then found, the last fortnight of March is the correct time, even at 2,000 or 3,000 feet elevation. Chapman tells me that "*E. epistygne* appeared very little earlier at Cannes than at Digne, and at about the same elevation, 1,800-2,500 feet, so that the strong testimony against a second brood at Digne is probably also applicable to Cannes. I captured a specimen close to St. Auban railway station on April 30th."

N.B.—I observe that a note by Dr. Chapman states that *Callophrys rubi*, *Pieris napi* and *P. brassicae* were first captured in February, not March.

The Genus *Oporabia*.

(Continued from p. 249).

By LOUIS B. PROUT, F.E.S.

2.—*FILIGRAMMARIA*, H.S. — There is abundant proof that this interesting insect is a perfectly valid species. Dr. Staudinger suggests that it may be a "Darwinian species"—whatever that convenient but mysterious term may really signify. The following notes on its specific right may possess some interest. (1) The male genitalia, as pointed out by Dr. F. Buchanan White in *Scot. Nat.*, iv., pp. 113-114, show an important structural difference, lacking a distinct hook on the harpes, which is prominent in *nebulata* (*dibulata*). This has been verified for me by my kind friend Mr. Pierce, who has taken immense pains with the genus, at great personal inconvenience, and to whom my warmest thanks are due. (2) The shape of the wings in both sexes (though not very reliable) generally shows considerable difference from *nebulata*, being narrower in all the wings, fore-wings more pointed, their hind margin more concave near anal angle, etc. (3) The average size is smaller, the females often exceedingly small. (4) Even the wing markings, though very similar, have some characteristic peculiarities. On the fore-wings, the central area is narrower on the average, the second line nearly always strongly angulated near the costa, and the subterminal generally more broadly dark shaded internally. On the hind-wings, the dark margin is generally more sharply defined, and its inner boundary cuts across the wing instead of running parallel with the cilia, as in *nebulata*. The under surface has a tendency to be more strongly marked, the dark band near the margin being generally prominent on both pairs of wings. Moreover, there is a strong gloss (often quite purplish) on the wings, which gives them a very different tone from *nebulata*. (5) Speyer (*Stett. Ent. Zeit.*, 1867, p. 126) discovered in his single specimen of *filigrammaria* (a ♂ received from Doubleday) so strong a distinction in the antennæ as to be even visible to the naked eye, and wondered that it had remained unnoticed by previous writers. This consisted in that they were much

thinner, especially near the tip, the incisions between the members much less deep than in *nebulata*, the ciliation somewhat weaker, etc. But Zeller (*Tijl. v. Ent.*, xiii., 247) says he does not find these distinctions substantiated in other specimens; and Mr. Nicholson and I compared several examples of each species under the microscope, without finding any considerable difference, though the incisions do seem a little deeper in *nebulata*. There is, however, a mystery about this question of the antennæ. Mr. Pierce has mounted several for me, and wrote that here we had "a very important character," though it is necessary to add that in a subsequent letter he wrote that "it does not seem very reliable." I should perhaps hardly have mentioned this note of Speyer's but for the coincidence that both Weaver and Gregson lay some stress on the more slender antennæ of their *autumnaria* as distinguishing it from *nebulata*. (6) Thanks to the kind help of Mr. J. E. R. Allen, of Bolton, I have been able to examine the eggs side by side, and found *filigrammaria* slightly larger, much more regularly shaped (true oval), less glossy, and *regularly pitted throughout*; eggs of *nebulata* were smooth and shining, and *only pitted at the blunt end*. (7) The newly-hatched larvæ are extremely similar, but my *filigrammaria* were considerably larger—nearly in the proportion of 4:3. (8) In the second, third and fourth skins, the colour of *filigrammaria* larvæ is more or less dark grey-green or blue-green, quite distinct from the bright green of *nebulata*. The larvæ of the latter also continued, until the final stage, very weakly marked, practically unicolorous; while *filigrammaria* (as already pointed out by Mr. Moberly in *Ent. Rec.*, viii., p. 41) becomes by degrees quite a striking larva, through the conspicuous yellow subdorsal lines, etc. The shape and gait of *filigrammaria* larvæ also remind me rather more of *O. brunata* than of *O. nebulata*. The head, scutellum and anal plate continue darker in *filigrammaria* than in *nebulata* at corresponding stages. The latter larva is stouter, with more pronounced segmental incisions. (9) The different habits of the two species seem to be sufficiently marked to add another distinguishing character of some importance; the matter of dates, localities, etc., however, remaining somewhat obscure until the tree-feeding variety (or species) *autumnaria*, Weaver, has been more thoroughly worked out; for if this is a variety of *filigrammaria*, it upsets our ideas by appearing (in Delanere Forest) at the same period as *nebulata*, and in the same locality.

The principal forms of *O. filigrammaria* have been discussed in Mr. Clark's article, already referred to (*Ent. Rec.*, vii., p. 289), which is readily accessible. I will only say for the clearing up of the synonymy, that I fell into error in accepting Guenée's citation of *polata*, Westw., to the *autumnaria* form. *Polata*, Westw. (*rev. Hb.*), is the small Manchester and Arran form, *i.e.* = typical *filigrammaria*.

As regards the distribution of *filigrammaria* and its varieties (or allies) outside the British Islands, much remains to be discovered, as Continental authors do not appear capable of differentiating them from *nebulata*. Staudinger adds "Northern Lapland, etc." with query. Meves (*Ent. Tidskrift*, v., p. 72) adds it to the Swedish list on the authority of some specimens determined by Hømeier, and Lampu retains it in his catalogue in the following volume of the same *Tidskrift*; but the determination seems dubious, as the distinctions specified ("the reticulated markings on the almost transparent wings")

do not strike one as being altogether to the point; and Aurivillius rejects it, saying that those examples which he has seen appear to belong to the preceding species (*nebulata*). I have not seen any Continental examples resembling our small typical *jiligrammaria*; but I have positive proof that one or more species differing essentially from *nebulata* do occur on the Continent.

I exhibit a specimen of Staudinger's "*dilutata* e Fennia sept.," which I submitted to Mr. Pierce on account of its close resemblance to Guenée's figure of his *autumnata* (*Atlas*, Pl. 18, fig. 7), and which he finds has "no trace of hook," therefore "undoubtedly *jiligrammaria* or *autumnaria*." Superficially, it does not remind me at all of either, but I see nothing serious against its turning out that our British *autumnaria* is a strongly differentiated local race of the same insect. I also exhibit a large ♂ from Schneeberg, sent me as "*dilutata*," but which I viewed with some suspicion, on account of its tone of colour, shape of wing, and angulation of second line; this likewise is pronounced by Mr. Pierce to be "of the *jiligrammaria* type," the anal flap slightly wider, but nothing upon which one could definitely claim specific distinction. In the national collection at Cromwell Road, quite a number of the so-called *dilutata* agree more or less with this Schneeberg example, and I hope to get a quantity of Continental material for examination. One specimen from St. Petersburg, and a few others seem to me to be, without all doubt, examples of this mysterious species. I shall be especially curious to investigate the white form, which is sent us by the Germans as "var. *autumnata*, Gn.;" it agrees precisely with Mr. Clark's *jiligrammaria* ab. *virgata* (*Ent. Rec.*, vii., pl. iii., fig. 10), except in its much larger size; unfortunately at present I have only females. As there is no doubt this form is the *autumnata* of Borkhausen (to which really that cruelly-abused name belongs), it will be very satisfactory if it proves to be the same species as *autumnaria*, Weav. The lower *dilutata* figure in Newman's *British Moths* (*pallascens*, Ckll.) seems likely also to belong here.

In the British Islands *O. jiligrammaria* is local, and appears to be quite absent from the southern parts of England. Several localities in Lancashire, Yorkshire, Cumberland, etc., produce it, as also Moel Varna, North Wales (*teste* Gregson). I have two pretty examples from Ireland (co. Derry), one the extreme ab. *melana*, Clark, the other a whitish specimen with dark finbria. In Scotland, Dr. F. B. White gives it as "not common," but has records for several of his mainland districts. Mr. McArthur informs me it is very common in the Isle of Lewis (from which locality he has very kindly given me some specimens), and in all parts of the West Coast of Scotland, where he has collected; he did not discover it in Orkney, whence it is reported.

Leaving out of the question the forms which may or may not be co-specific with this, we find there is remarkable unanimity as to its being, in its typical forms, a moorland and mountain species. Mr. McArthur considers the best localities to be open places in woods, where there is a mixture of heath and rush. In a state of nature, the larvæ have been found on ling (R. Kay, in *Entom.*, ix., p. 159), and apparently *Vaccinium myrtillus* (see Gregson in *Ent. Weekly Intell.*, v., p. 156). In captivity they have been frequently bred on hawthorn, willow, etc., etc., and seem by no means particular as to their food. Mr. Moberly communicates to me the interesting fact

that larvæ which he had been breeding on hawthorn forsook it in favour of sallow and birch when the opportunity offered. I mention this as showing how little emphasis can safely be laid on the assumed differentiation of *autumnaria* or *approximaria* as birch feeders. The appearance of Buckler's 7th volume (*Larvæ of British Butterflies and Moths*), containing figures and descriptions of *jiligrammaria* larvæ, ought to assist in clearing the ground for further research amongst the woodland forms, to which I have now to turn your attention. I am sorry to say that I have as yet arrived at nothing very definite, but I trust I shall be doing some useful service in bringing together the more important of the scattered notes of from 20 to 50 years ago, in order that the present generation of entomologists may see exactly where matters stand. If I may judge from the amount of trouble which my researches have cost, I shall at least be saving future workers a great deal of time.

To begin with, then, let me offer a brief chronological history of the discovery of the forms in this country.

1839-1841.—Edleston took one female *per annum* (of true *jiligrammaria*) at Staleybridge, near Manchester. No name was immediately found for these.

1841.—Weaver met with the same form in the Isle of Arran, and after being told by two or three entomologists that it was only a variety of *dilutata*, got it named *polata* (erroneously, of course), by J. F. Stephens.

1842.—Edleston published these captures under the name *polata* (*Entom.*, i., p. 356).

cir. 1840.—Sir W. Jardine sent Doubleday a specimen of the large form (or species). Doubleday felt convinced it was distinct from *dilutata* (*Zool.*, 1858, p. 6103).

1843.—When Doubleday was in Paris, he saw the insect which I have already described as *autumnata*, Gn., standing under the MS. name of *autumnaria*, Bdv. From memory, he identified his Scotch insect with this—a conclusion which he and Guenée afterwards decided was erroneous.

1843.—Westwood figured the Staleybridge and Arran species as *polata*.

1845.—Weaver, in the *Zoologist* (p. 847, under date Nov., 1844), catalogued "*Operabia* (sic) *jiligrammaria*," without comment among a list of his Arran captures. Hence it had evidently been discovered that it was not the *polata* of Hübner; but when, and from whom, it received the name of *jiligrammaria*, I have been unable to ascertain. Doubleday, in his first catalogue (Nov., 1849), ascribes it to Boisduval, and it is likely enough it was one of his numerous manuscript names. Many of these were utilised by Herrich-Schaeffer, to whom apparently we owe the first publication of the name *jiligrammaria* (figured 1846, described May, 1848).

1849.—Doubleday, in his first "Synonymic List," introduced three species of *Oporabia*, under the names *dilutata*, W.V., *autumnaria*, Bdv., and *jiligrammaria*, Bdv.

1850.—Stephens (*Br. Mus. List*) accepted the same three species, with (?) *neglectata* in addition.

1852.—Weaver published his notes on the genus (*Zool.*, p. 3495), making out six species, which I have noticed in their places. His

autumnaria certainly agreed with Doubleday's, and as Doubleday had not described it, the name stands as *autumnaria*, Weav.

1854.—Westwood figured *autumnaria*, Weav., as a good species, in his supplement to Wood (fig. 1727).

1855.—Stainton questioned the distinctness of *autumnaria*, Weav., from *dilutata* (*Ent. Ann.*, 1855, p. 41).

1857.—Guenée, with greater approach to accuracy, sunk *autumnaria*, Weav., as var. to *jiligrammaria*.

1858-9.—A controversy on the genus, carried on by Gregson, Doubleday and Logan, appeared in the pages of the *Zoologist*. Gregson admitted five species, Doubleday (and probably Logan), two only.

After this, Doubleday's second catalogue (1859) held sway to a large extent, and most entomologists were content to follow it in reducing the species to two. But in the *Scottish Naturalist*, vol. iv. (1877-8), Dr. F. Buchanan White re-opened the question, and wrote a most important article (pp. 111-116, with plate), urging the claims of *autumnaria*, Weav., to specific rank, and re-naming it *addendaria* (*tom. cit.*, p. 160), to avoid collision with *autumnata*, Gn., which he recognised as distinct. It is much to be regretted that this correction of name has been lost sight of, as constant confusion results. One of my best-informed correspondents was tripped up in this way, writing me, in the course of some notes on Buchanan White's *autumnaria* (*addendaria*) that "Guenée says the larvæ is velvety green without markings," which really applies to *autumnata*, Gn.

I will now conclude with some further details of the claims of this "*addendaria*," and of *approximaria*, and would urge our northern friends to obtain and freely distribute eggs of these forms, in order that the early stages may be thoroughly worked out, side by side with those of *jiligrammaria*. That *addendaria* is not a variety of *nebulata* (*dilutata*), as once suggested by Stainton, and as Mr. Penn seems now to think, is conclusively proved by the ♂ genitalia.

(To be concluded).

On the value of Larval Characters.

By PROFESSOR A. RADCLIFFE GROTE, M.A.

The publication of Dr. Dyar's papers on the structural characters of Lepidopterous larvæ, in the *Entomologist's Record*, allows me the opportunity of bringing the value of these characters in classification to issue. Dr. Dyar divides the *Saturniades* into two main groups:—

I.—A single dorsal tubercle on 9th abdominal segment.

II.—No single tubercle on 9th abdominal segment.

Under this arrangement *Aglia* becomes a member of the *Saturniadae*, and the recognition of the fact that it really belongs to the first series (I.) is lost sight of. The loss of the tubercle by *Aglia* is, in my opinion, secondary. It runs parallel to the loss of the tubercles in the *Saturniadae* on various segments, and is not a primary character by which a family can be naturally circumscribed. In the same way, I believe that the presence of the dorsal tubercle in certain North American *Saturniadae* (*Hemileuca*) points to the fact that this tubercle was characteristic for the type from which the two divisions I am inclined to recognise to-day have sprung. *Hemileuca* is

a "low" Saturnian, not a "high" Citheronian; similarly, *Aglia* is a "high" Citheronian, not a "low" Saturnian.

All the Emperor moths I have yet been able to examine, allow of their being placed in two family groups, which correspond very nearly to Hübner's *Echidnæ* (my *Agliadæ*), and *Heracæ* (my *Saturniadæ*). Thus, from characters offered by the imago, I offer a classification which allows of a test being made between it and a classification dependent upon the larval tubercles offered by Dr. Dyar. Leaving aside the fact that the morphological value of the larval characters may not be always correctly appreciated by Dr. Dyar, there appears the fact of a bold contradiction between neuronal and larval characters, as respectively interpreted. From my point of view, I go as far as this: The acceptance of Dr. Dyar's classification or division of the Emperor moths upon the presence or absence of larval tubercles, as against mine upon the neururation of the perfect insect, involves the rejection of the neururation as of any value whatever. More than this, it involves the rejection of all other characters drawn from the imago, since all other characters fall in with my grouping much more easily and naturally. It is a distinct forcing on general characters to class *Hemileuca* and *Automeris* (*Hyperchiria*) in one "family." No explanation is offered, or can be offered, how insects with such contradictory types of neururation can be members of the same "family," while other "families" violently claim their interpolation, since they offer precisely the two respective types which are here badly mixed by Dr. Dyar, upon the comparatively unimportant character of the existence or suppression of a larval tubercle. "Stinging spines" are clearly a matter of adaptation, arising independently in different groups. In pointing out elsewhere the value of Dr. Dyar's classification, arising out of the relative position of the larval tubercles and their arrangement, I have disputed their specialisations as of value to determine the limits of family groups, and for this reason: the specialisations of larvæ (and of pupæ and cocoons) follow independent lines, and cannot be brought into coincidence, for the purposes of an artificial system, with the specialisations of the imago. I pointed out this fact as to the larvæ more than twenty years ago. The presence, relative condition, or absence of the dorsal tubercle is a character of specialisation.

Therefore, the issue lies in this: If we are to recognise such larval characters in our system, we must abandon all study of the imago as useless. The Emperor moths are a case in point, and I join issue with Dr. Dyar in the classification of the *Saturniidae*; and I believe that this matter must be cleared up before we can go any further.

On the development and probable origin of certain ocellated spots in the larvæ of *Lasiocampa quercus* and *Odonestis potatoria*.

By A. BACOT.

I wish to call attention to the white spots which are present in the centre of the sub-dorsal area of the meso- and post-thoracic segments of the larva of *L. quercus*. These spots are developed from the ends of the last and largest of the orange transverse bands which cross the dorsal area of these segments, and which, together with similar stripes

on the abdominal segments, give the young larva its characteristic appearance. After the first larval moult, the ends of these bands on the meso- and post-thoracic segments become very much lighter, and upon the larva attaining its adult stage, these cream-coloured ends are left as disconnected spots, due to the loss of the orange transverse bands, or their obliteration by the dorsal hairs. Young larvæ of *Odonestis potatoria* possess similar bright yellow spots in the same position, but, in this species, they are clearly marked as spots in the first skin, and, although clearly marked in the fourth skin, have not undergone, and do not undergo, any further development, at least before hibernation.

I was making some observations on the larva of *L. quercus* in August, 1896, and I was greatly puzzled as to the probable significance of these spots, but, whilst examining larvæ of French *L. quercus* and *L. spartii*, this autumn, I noticed that at or about the fourth stage, the spots in question developed into a prominent white oval spot, with rather pointed ends, and with a circular orange centre. This combination of the two colours was too remarkable to be overlooked, and they immediately called to my mind the manner in which the ocellated spots on the larvæ of *Choerocampa elpenor* are developed. I at first thought that these spots on the larva of *L. quercus* might be the remnants of identical ocellated spots transmitted from a common ancestor, but on reference to my notes on the larva of *C. elpenor*, I found that the ocellated spots were situated on the first and second abdominal segments from swellings in the sub-dorsal line, and not, as in the larva of *L. quercus*, on the meso- and post-thoracic segments.

I think, however, that the spots in question are really the remnants of ocellated spots, that probably had a protective value as warning markings in the ancestral larval form of *L. quercus* and *O. potatoria*; and I would point out that imperfect or rudimentary ocellated spots are present on the post-thoracic segment of both *C. elpenor* and *C. porcellus*; also that a large black ocellated spot, with two blue pupils, is present on the third thoracic segment of the larva of *C. neri*, while the larvæ of *Deilephila galii* and *D. euphorbiæ* have a series of large yellowish spots on the sub-dorsal area of all the segments, from the meso-thorax to the eighth abdominal.

SCIENTIFIC NOTES AND OBSERVATIONS.

APHOMIA SOCIELLA IN BEES' AND WASPS' NESTS (*vide, ante*, p. 259-260).—On August 13th I took the nest of *Vespa rufa*—a rare wasp with me—from a hole in a bank, formerly used by a mole, about a foot deep. The top of the nest, which is composed of a tough grey paper, similar to that used by *V. sylvestris*, was full of *Aphomia* larvæ of various sizes, but they had not attacked the interior of the nest, except one tier of empty cells.

Four days later, I took a large colony of *Bombus lapidarius* out of a rats' hole in a pig-stye. The bees had utilised the old rat's nest, composed of hay, straw and bits of rags, stolen from the house, and had deposited an immense quantity of honey in the empty cells. Here the larvæ swarmed in hundreds all over the nest, which had evidently been selected for attack by more than one moth, and I found many cells eaten through, and many dead bees spun up in the web, which weighed just 18 ounces.

On August 23rd I took a nest of *Bombus latreillellus*—a bee very little known—deep in a mouse-hole, on pasture. The entrance was nearly blocked by a web as large as a French walnut, spun up by the *Aphomia* larvæ, which had migrated from the nest, as they frequently do. In the nest itself were some others of the larvæ, and those of a small moth unknown to me, possibly (*Ecophora pseudopretella*).

As I have before remarked, the moth usually affects the nests of the surface bees, viz., *B. derhamellus*, *B. agrorum*, *B. venustus* and *B. sylvarum*, and to find it underground is not of very frequent occurrence, and, I fancy, it is owing to the very dry season which has laid open so many nests of the surface bees to their various enemies.—W. H. TUCK, M.A., Tostock House, Bury St. Edmunds. October 24th, 1897.

THE GEOMETRID FAMILY AMPHIDASYDÆ.—The *Amphidasydæ* are a small and tolerably compact group of moths, placed, no doubt rightly, somewhere near the *Boarmiidae*. Guenée has them after the *Ennomidae* (last British species *Himera pennaria*) and before *Boarmiidae* (first British species *Heimerophila abruptaria*). Staudinger has them between *Anisopteryx* and *Hybernia*, perhaps on account of their frequent winter appearance and wingless ♀s, but there is nothing scientific in this arrangement, and I do not see the slightest relationship here. Packard, however, says the venation of *Hybernia* agrees with *Biston* and *Amphidasys*. I do not know the earliest stages of *Himera pennaria*, but the *Amphidasydæ* seem to have some connection with *Selenia*, and the young larvæ are something like *Tephrosia*, etc. The British genera comprise *Phigalia*, *Biston*, *Nyssia* and *Amphidasys*. The Museum collection shows very few, if any, links with the *Boarmids*; hence the group would appear tolerably specialised. They there form part of the great sub-family *Boarmiinae*, which includes *Ennomidae*, *Fidoniidae*, etc., of Guenée, following some “thorn” genera, and preceding *Hybernia*. Meyrick also has these united in one family—his *Selidosemidae*. Packard keeps *Ennominae* and *Fidoniinae* away from the *Boarmiinae*, but includes the winter groups, *Hyberniidae* and *Amphidasydæ*, of Guenée, with the latter. Mr. Tutt also leads on from *Hyberniidae* to *Boarmiidae*, and thence to *Amphidasydæ*, though giving each family rank. He also incidentally suggests that the *Fidoniidae* may have strong affinities with certain of the *Boarmids*. The British Museum collection contains nearly 30 species of *Amphidasys*, several being Asiatic and N. American. The Americans have two or three representative species or local forms, thus, *A. cognataria*, Gn., represents our *A. betularia*; *B. ursaria*, Walker, our *B. hirtaria*, and *P. strigataria* our *P. pedaria*. A few typical *Amphidasys* partake also of some features of both our British species, *A. strataria* and *A. betularia*. These two species are very closely allied, and Staudinger appears to me to be wrong in removing *A. strataria* into the genus *Biston*. Experiments have shown that the two can easily be hybridised, if they can only be made to emerge at the same time. On the other hand, it is just possible *Nyssia* has some right to be united with *Biston*; *B. hirtaria* and *N. hispidaria* seem pretty close in some ways, but perhaps our British system of genera is the best. *Phigalia*, with one species, is fairly distinct; yet the larva, and, to some slight extent, the female imago, bring it rather close to *N. hispidaria*. *Nyssia* is an interesting genus of rather small moths, stoutly built, with very hairy

apterous ♀s, and containing some Alpine, boreal, and other local species. *Biston* is restricted, since it contains apparently *hirtaria* only, and its American representative *usaria*. *Biston hirtaria* is evidently local, both on the Continent, and in Britain. Why should it be so attached to London? The ♀ is winged, but hardly seems to fly much. A male moth being pinned to a tree, a ♀ has been found *in cop.* with it in the morning.—L. B. PROUT, F.E.S. [Extract from paper read before the North London Entomological and Natural History Society.]

EREBIA GLACIALIS: WITH AN INCIDENTAL NOTE ON FROZEN INSECTS.—Under the Mattwald Glacier, descending from the Rossboden Pass, between Simplon and Saas-un-Grund, I found *Erebia glacialis* in some profusion, on the morning of August 7th. It is by no means an easy insect to capture, as it haunts the steep, rocky, and treacherous moraine débris, and with an ice-axe in one hand I found it extremely difficult to wield the net in the other effectively. The morning was, moreover, overcast, and it was only in the rare intervals of sunshine that *E. glacialis* was on the move. I found an *Erebia*, not *glacialis*, at the very summit (10,500 ft.), though it was blown away before I could identify the species, for I was making the morning meal, at 8 a.m., after a climb of four hours from the village of Simplon. It was also interesting to observe, in traversing the Griesseren Glacier on the Simplon side, that several insects were frozen hard and fast in the ice. They were *Melitaea aurelia* var. *britomartis*, *Pieris callidice* and *Colias phicomone*—the latter strong Alpine flyers, and I think for that reason more likely to have been dropped by birds than to have been overcome by the cold. A *Plusia*, too, was lying stark upon the glacier. A few days later *Erebia glacialis* turned up again on the Langeflüh, at Saas Fée, but in a very dilapidated state; and I also saw, but did not take, several ragged specimens near to the Mattnark Lake, on the path to Monte Moro, where the var. *pluto* is also said to occur.—H. ROWLAND BROWN, M.A., F.E.S., Oxhey Grove, Harrow-Weald.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

DESCRIPTIONS OF LEPIDOPTEROUS EGGS.—*Trypbaena fimbria*.—The eggs are laid closely side by side, each one touching (or almost touching) six others. They form about two-thirds of a sphere, and have a conspicuously regular circular outline. To the naked eye they are delicate green in colour; but under the microscope are rather yellowish-green. The shell is delicate and shining. At the equator there are 32 distinct longitudinal ribs, not particularly prominent, and uniting in twos and threes as they near the apex of the egg. As a result, only from 10-12 reach the micropylar area, around which the united edges of these ribs form a shallow rim. Within this rim there is a slight depression, in the centre of which is a delicate rounded micropylar button, raised almost to the level of the outer rim. There is no distinct transverse ribbing, although the wavy appearance of the longitudinal ribs at their summits indicate a delicate attempt at ribbing, not otherwise observable. [Described under two-thirds lens, on September 26th, from eggs received from Mr. J. Clarke, of Reading, on September 24th.]

Euclidia glyphica.—The eggs described were laid side by side on cover of a box. Almost spherical in shape, except for the flattening at the basal attachment, and a still slighter flattening at the apex. Of a pale green colour when first laid, with opaque whitish patches running round the egg transversely; becoming darker green later. There are about 30 faint, pale, longitudinal ribs running from base to apex, ending just short of the apex on the ridge surrounding the micropylar area. The micropylar area forms a shallow depression, at the bottom of which the micropyle forms a tiny rosette. [Described August 1st, from eggs laid by a ♀ captured at Aix-les-Bains. These eggs proved infertile.]

Acontia luctuosa.—The eggs described were laid singly on the inside of a box. The egg forms rather more than half a sphere laid on its flat end. The newly-laid egg is of a pale yellow colour to the naked eye, but under a lens the basal area is whitish, and the upper half more yellow in colour. It is very finely ribbed longitudinally from base to apex, with about 26 fine (but conspicuous) white, shiny ribs, some of which unite before reaching the micropylar area, which consists of a small reddish-brown depression at the apex of the egg. Two or three days after deposition the egg becomes entirely whitish, with a row of red-brown spots just above its equator. The ten or twelve surviving ribs form a very distinctly marked corona round the edge of the micropylar area. [Described August 6th, from eggs laid by a ♀ captured at St. Michel de Maurienne.]

Phytometra viridaria.—The eggs are laid closely side by side. Each egg forms rather more than half a depressed sphere, but the basal area is somewhat rounded. The newly laid egg is (August 20th) of a clear pearly-white colour, covered with two sets of fine oblique lines running from the micropylar area to the base, and dividing the egg roughly into diamond-shaped spaces (with the long diagonal extending in direction from apex to base), at each point of which there is a distinct large, red-brown spine, standing perpendicularly to the surface of the egg. The micropylar area is quite white, slightly depressed, and very finely reticulated, with no spines. In a day or two (August 22nd) the egg becomes very striking. It is now surrounded with bright claret-red rings, one of which surrounds the micropylar area, and another the shoulder of the egg, the remaining parts of the egg remaining white* in colour. The micropylar area also remains white. The red bands are so far irregular, that cross pieces occasionally unite the upper band with the lower. The lower half of the egg is not coloured with red. By August 27th, the red parts had much increased, although arranged distinctly as two separate rings (with an occasional junction), and a red spot here and there now occurs on the lower half of the egg. The spines are at this time very conspicuous, and each is seen to have a stumpy octagonal pyramid for base, the eight sides of the pyramid being continued to form the sides of the rhombi, previously described. There is a distinct secondary ribbing (transverse) noticeable. This divides each rhombus into two triangles by means of a slightly raised whitish thread, forming the shorter diagonal. [The description was made under a two-thirds lens, from observations made on August 20th, 22nd and 27th. Eggs laid by

* The white parts look quite cream-coloured under a lens of low power. Under a high one they appear to be quite white.—J.W.T.

a ♀ captured at Aix-les-Bains, on August 18th.] I observe that Hellins (*E.M.M.*, ii., p. 163) says: "The eggs of *P. aenea* (*viridaria*) are of the ordinary *Noctua* form, round, ribbed, and with flat under-side." I simply remark this, as the description evidently wants verifying by someone when eggs of this species are again available. I know mistakes will happen, and that eggs have before now been described as those of an insect which did not lay them, but which happened to be in the box when the eggs were first observed.

Acidalia ochrata.—The eggs were laid loosely in a box by a confined ♀. There is considerable variation in the shape of the eggs, but they are broadly oval in outline, rather flattened at the micropylar end, the length : breadth :: 4 : 3½. There is a deep depression on the upper surface, placed chiefly towards the end, remote from the micropyle, so that this end of the egg is much thinner than the micropylar. The egg is of a dull greyish-yellow colour, covered over with a most striking coarse dark grey polygonal (mainly hexagonal) reticulation, arranged longitudinally. The micropyle is placed centrally at the broad end of the egg. It consists of a minute clear central area, surrounded by much finer polygonal reticulation than that characterising the remainder of the egg. [The eggs were laid on August 22nd by a ♀ captured at Aix-les-Bains, and the description was made on August 24th under a two-thirds lens.]

Thecla w-album.—The eggs are laid above or directly below an aborted leaf-bud, and harmonise so exactly with the colour of the bark of the elm twig on which they are placed, that only an entomologist could possibly detect them. They appear to be placed on the old and not on the growing twigs, and are laid either in couples or singly. The egg is remarkable in appearance, owing to a prominent whitish belt which runs around its equator. A side view gives a distinct idea, even under a lens of moderate power, that it is minutely hairy. Looked at from above, the egg presents the appearance of a whitish rim, extending beyond a dark reddish central portion, which is heaped up cone-like, but flattened on the top with a circular depression at the apex [I can think of no better simile than a jam tart, with a prominent crust, the jam heaped-up centrally and then flattened on the top]. The white rim consists of the upper (and protruding) layers of pointed cells of which the base is formed, the lower rings of these cells decreasing in size until the point of attachment is reached, the whole forming a sort of shallow basin, in which the central part of the egg is placed. The central part of the egg forms a flat truncated cone, dark reddish in colour, minutely pitted, and suggesting towards the lower part of the cone a polygonal structure. A large number of points also arise from the surface, and there is a suspicion that these bear minute hairs. The micropylar area is very conspicuous and well-defined. It consists of a circular basin, in the centre of the flattened apex, the sides of the hollow almost perpendicular, the micropyle proper appearing as a minute depression in the centre of its base, and surrounded by concentric rings of tiny cells. [Eggs received July 17th, from the Rev. G. H. Raynor, described under a two-thirds lens on July 19th.] Newman describes the egg as being "shaped something like an orange, but more depressed on the crown." I should like to know what egg Newman had.—J. W. TUTT.

ON THE CAUDAL HORN OF AGDISTIS.—I was much astonished at the

appearance of the caudal horn of *Agdistis* when I first examined it, and thought it must be something allied to the Notodonts. I found, however, on examination, that the horn does not rise from the 8th abdominal segment, and bear the anterior trapezoidals of that segment, as in the Sphingids, etc., but that it is situated on what is either a small 9th abdominal segment, or a large and distinct sub-segment, of the 8th abdominal, both the anterior and posterior trapezoidals of the 8th segment being in front of the horn, and in their correct position relative to the spiracle.—A. BACOT.

NOTE ON THE LARVA OF *DEILEPHILA EUPHORBIE*.—On July 28th-29th, we found one hundred and twenty larvæ of *Deilephila euphorbie* feeding on sea-spurge (*Euphorbia paralias*), on the coast of Brittany, at Le Pouldu. There were individuals in all the skins, and the larvæ were very abundant. The eggs appear to be laid on the tops of the young shoots of the spurge, the latter forming the food of the newly-hatched larvæ, which eat the tops of the shoots for some time (until in third skin), but at the 3rd or 4th moult (when the red first appears) they feed on the leaves at the base of the stalks, which are red. The young larvæ eat through the stalks, below the seeds, so that the sand all round the eaten plants is covered with the seed-heads. We almost always found the caterpillars in pairs, although the only batch of eggs we found consisted of about a dozen. The larvæ, if handled roughly, eject small jets of a fluid, very similar to the juice of the *Euphorbia*, and throw it from side to side by means of sudden jerks of the thorax. This fluid causes a very violent irritation if it gets into scratches, or into the eyes. On August 1st, the larvæ were transferred to another species of *Euphorbia*, which they ate readily. By August 4th, some of the larvæ ceased to feed, and commenced to pupate. The larvæ make a hole about half-an-inch deep, "roofing" and "walling" it with silk, mixed with sand, bits of leaves, etc., but without making a distinct floor. They remain in the cocoons about a week before turning to pupæ. In spite of the normal habit of the larva to make its cocoon partially underground, many individuals made up their cocoons on the surface, among leaves (when earth was not available), the silk used being dark yellow in tint. The changes in colour that many larvæ undergo are as follows:—The red dorsal stripe turns yellow, then black; the sub-dorsal and supra-spiracular spots undergoing the same changes in turn. Then the caudal horn, head and legs, become blackened (without, however, turning yellow). In the very black forms, the supra-spiracular spots almost cease to exist, and the sub-dorsal are only visible because of their brighter surface. About seventy larvæ underwent the above changes, and these must have been quite normal, and not due to disease, for the larvæ continued to eat most ravenously, and out of about eighty larvæ, which did not go down at once, we only lost five. If this species be subject to the attacks of parasites, it is possible that they will appear in the pupal stage; we have not lost a single larva from this cause. Three imagines have already appeared from these pupæ. What are they doing to emerge at this time of year?—EDWARD S. HARRISON, Josnes, Loir-et-Cher, France. Sept. 29th, 1897.

ON THE COCOON OF *SPHIX LIGUSTRI*.—I have just had larvæ of this species pupate successfully. The larva went down about two inches, and there made a dome of beaten earth, about one inch high by two and a half inches long. Like the larva of *Deilephila euphorbie*,

it makes no special floor in constructing its cocoon.—E. S. HARRISON, Josnes, Loir-et-Cher, France.

VARIATION.

TILIACEA (XANTHIA) AURAGO AND ITS ABERRATIONS.—Among the *T. aurago* that I have taken this year are some almost scarlet in colour, and not of an orange tint at all. I have found that the ab. *virgata* appears first, whilst the ab. *fucata* does not appear until quite a week later, and the numbers of these aberrations are then respectively about 7 per cent. and 10 per cent. of the number caught. The ab. *virgata* is more common by far than the typical form, as described in the *British Noctuae and their Varieties*.—(Mrs.) E. C. BAZETT, F.E.S., Springfield, Reading. October, 1897.

PLEBEIUS AEGON VAR. CORSICA IN WESTMORELAND.—The beautiful var. *corsica* of *P. aegon* was again captured this year on our Westmoreland Fen. There is no trefoil within a considerable distance of the locality in which they occur, but they are found among a very low species of rush, about three inches high.—H. MURRAY, Lowbank Villas, Carnforth. [We are much indebted to Mr. Murray for a very fine series of this insect; the females are very beautiful indeed. The form only occurs as a very rare aberration in the haunts of *P. aegon*, in our southern counties.—ED.]

POLYOMMATUS (PLEBEIUS) ZEPHYRUS VAR. LYCIDAS.—Trapp (*Report Swiss Ent. Soc.*, I., 103) places this Lycænid as an intermediate form between *Plebeius aegon* and *P. argus*. Judging from the two specimens I was fortunate enough to capture, I should be inclined to think it much nearer to *Polyommatus corydon*. However, I did not take the male, though I know it to be a rather more important insect than either the above. The locality for *P. lycidas* on the Simplon is well known to local collectors, but as it produces the species in great profusion, there is no immediate prospect of extermination. I found the food-plant, *Astragalus*, growing freely at the spot indicated to me by collectors at Berisal, but I was fully a fortnight late, and the two females I took were in a wasted condition, one so much so that I did not keep her. The little white eggs laid on the woolly leaves of the *Astragalus* were already (August 3rd) hatched out, and on one plant I discovered tiny louse-shaped larvæ, which I have no doubt were those of this interesting species. They were pale green, with a yellowish lateral stripe. I only know of one other locality in Switzerland besides that on the Simplon, somewhere near Visp, at the entrance of the valley leading to Zermatt and Saas Fée, where Mr. Stauden, writing in the *Entomologist* (vol. xxiii., p. 57), mentions that he took a single specimen, in July, 1885. As, however, he records a capture on the Gemmi, on the opposite side of the Rhone Valley, I am led to think the species may be more widely distributed than the text-books admit.—H. ROWLAND BROWN, M.A., F.E.S., Oxhey Grove, Harrow-Weald.

PRACTICAL HINTS.

Field Work for November and December.

By J. W. TUTT, F.E.S.

1.—The cocoon of *Notodonta trepida* is to be found in November, at the roots of oak. It prefers a sandy soil.

2.—The dry friable turfs, collected in the corners at the roots of oak, should be well searched, as well as the corners themselves, for cocoons of *Drymonia chaonia* and *dodonea*. Run your hand along the trunk carefully for adherent cocoons.

3.—Almost all the *Cymatophora ocularis* in collections are bred from pupæ which are found spun up at the roots of various kinds of poplars. The pupæ of *Tæniocampa populeti* are to be found deep down at the roots of the same trees.

4.—The pupæ of all the Tæniocampids should be dug for in November. A detached tree usually gives much better results than those growing close together.

5.—In November, and on through the winter, the conspicuous yellow cocoon of *Dasychira pulibunda* is easily found among the loose rubbish collected about the roots of various trees, or under loose bark.

6.—The cocoon of *Demas coryli* may be found, sometimes plentifully, under moss, at the roots of beech trees, very rarely on the trunk, from October on through the winter.

7.—The black cocoon of *Poecilocampa populi* is to be found in October and November, firmly glued to the inside of a piece of loose bark, or spun up tightly among decayed leaves near the base of the tree.

8.—In October and November, work round the roots of willows, on the banks of ditches and streams, on the side nearest the water; the sods there should be shaken, and the cocoons of *Leiocampa dictæa* and of *Ptilodontis palpina* will be found done up among the dry roots.

9.—The pupa of *Eurymene dolobraria* is to be found by loosening the edge of patches of moss on beech and oak trees, in November.

10.—The pupa of *Eupithecia dodoneata* may be found through the winter months under loose bark on hawthorn trees.

11.—November is the month to find the weak cocoon of *Lophopteryx camelina*, under moss, on oak, beech, elm, etc.

12.—Turn over stone-heaps, etc., in November, for *Dasypolia templi*, a widely distributed insect in the north, but retiring in its habits. Where stone walls are made from flat stones, the latter are often allowed to lie about in heaps, and by turning them over, one or two *D. templi* may be found in every heap (Robson).

NOTES ON COLLECTING, Etc.

NOTES FROM BROXBOURNE.—The members of the North London Natural History Society visited Broxbourne on July 3rd, 1897, arriving there, *via* Liverpool Street, at about 2.45 p.m. The party made its way, by a rather circuitous route, to "The Woodman," Wormley West End. Messrs. Fuller and Garland found the larvæ of *Eupithecia renosata* by the side of the path, in the pods of *Silene inflata*. Soon afterwards Mr. Prout beat out a specimen of *Acidalia interjectaria*. As the party proceeded, it became evident that certain Geometrids were to be had by beating, mostly *Acidalia aversata*, *Larentia didymata*, and *Cidaria fulvata*, but including some beautiful little specimens of *Melanthia bicolorata*, just out. Three specimens of *Cucullia umbratica* were taken on fences; and the larvæ of *Eruchloë cardamines* occurred not uncommonly on *Cardamine pratensis*, but *Zygaena trifolii* was a total failure, not one being seen. The party enjoyed a hearty tea at "The Woodman," at 6 p.m., and walked back

by the direct route. *Acidalia aversata* and *Larentia didymata* swarmed at dusk, but practically nothing else was taken, though *Phorodesma pustulata* was seen. — LAWRENCE J. TREMAYNE, Hon. Sec.

THE HABITAT OF CRAMBUS ALPINELLUS.—This species is rare in England. It was taken in some numbers by Moncreaff, at Southsea, and I have taken it myself at Deal. When this species was added to the British fauna, Knaggs wrote (*E.M.M.*, viii., p. 110): "*Alpinellus*, I presume, was named on the principle of 'lucus a non lucendo,' since Zeller remarks, 'in *Alpibus nunquam inventus est*' It inhabits sandy grassy spots, especially in fir woods." I have myself taken it in the Dauphiné Alps, at about 4,500 feet, between Le Dauphin and Le Freney, in the Romanche Valley, in a waste field far from woods, and by the roadside, where also *Acidalia rubricata* was abundant. It would appear, therefore, that Zeller's observation will not altogether hold good. *C. alpinellus*, it appears, must be added to those species which, like *Lithosia lutarella* var. *pygmaeola*, *Acidalia ochrata*, etc., love the waste fields in the lower Alpine districts, and in England are strangely confined to the coast. *L. lutarella* in its typical form, of course, goes much higher, but the variety rarely reaches an altitude much above 4,000 feet.—J. W. TUTT.

NOTES FROM NEW FOREST AND WICKEN.—My collecting this year has been confined to the New Forest and Wicken Fen, and I have done but little in either locality. I began at the end of April beating for larvæ of *Apatura iris*, but found that occupation scarcely more remunerative than it was last year. At the same time the oaks produced larvæ of *Boarmia roboraria* and *Hylophila quercana*, and a few of *Phorodesma baiularia* were taken. Earlier in the season larvæ of *Cleora glabraria*, *C. lichenaria* and *Boarmia abietaria* were taken at least as freely as usual. One larva of *C. glabraria* yielded a fine dark suffused specimen. Larvæ of *Agrotis agathina*, after having been very scarce for several years, were more plentiful this year. It is worth a note that several of the insects, which until recently were looked upon as common in the New Forest, have become rather suddenly scarce, among which may be mentioned *Lithosia sororcula* and *Boarmia consortaria*.

The season at Wicken appears to have been quite up to the average, though there, as elsewhere, many of the species have occurred a good deal later than usual. In the earlier part of the season *Cymatophora ocellaris* and *Leucania obsoleta* were taken sparingly, and two specimens of *Hydrilla palustris*; but, so far as I have been able to ascertain, no *Hadena atriplicis* and but few *Agrotis obscura*. At the beginning of August there were very few specimens of *Pharetra (Arsilonche) venosa*. I took, however, one finely-marked specimen of *Celaena haworthii*, a species which the local collectors appeared not to recognise, although it had previously been recorded by Tugwell. There was also a specimen of *Acidalia rubricata* taken at light in the Fen itself, which is unusual; and so late as August 3rd, I captured *Macrogaster arundinis*, a date which gives a wider range of flight to that insect than is generally assigned to it.—J. C. MOBERLY, M.A., F.E.S., 9, Rockstone Place, Southampton.

LEPIDOPTERA AT SANDOWN.—Soon after my arrival at Sandown, this year, I obtained one or two nice aberrations of *Bryophila perla*, two or three *Agrotis exclamationis*, with confluent stigmata, and a fine melanic aberration of *Miana literosa*. I never remember to have seen

an example like the latter, though I suppose our Scottish friends ought to get it. Melanic forms of *Agrotis nigricans*, *Xylophasia monoglyphia*, *Noctua xanthographa*, etc., are, of course, well known in the north, and northern *M. literosa* are, on the whole, quite perceptibly darker than ours. As regards rarities, only the faithful *Lencania albiguncta* has yet favoured me; it put in an appearance on August 9th, a date intermediate between my 1896 record (Aug. 3rd) and those of 1894 and '95 (Aug. 18th and 19th respectively). Last night, however, I took a specimen of what is a great rarity to me, as I have not yet discovered its habitat, namely, *Plusia festucae*, of which a specimen came to my sugared fence, my only previous record being of a specimen on the same sugared fence, about six years ago. As for the rest, I have taken most of the ordinary things which are to be got here, and which I have recorded in previous years. A few of the species, which are usually quite "over" when I arrive here, were not quite over this year, though nearly so; for instance, *Agrotis corticea*, *Xylophasia sublustris*, *Hadena dentina*.—L. B. PROUT, F.E.S. August 17th, 1897.

COLLECTING IN SWITZERLAND.—The month of August, so far as my own observations are concerned, was anything but satisfactory to the collector. Day after day the weather at Berisal (first week), and later, at Saas Fée, was overcast and wet, and, compared with the records of 1894, at the latter place my note book is extremely meagre. The best time for Berisal and the Simplon is, I should think, at least a fortnight or three weeks earlier; indeed, by the middle of August, both here and elsewhere, the majority of Alpine species have practically gone over. Especially noticeable was the absence of *Colias phicomone*, as a rule, one of the commonest species at the higher elevations, and *Argynnis* were in many localities equally scarce. Indeed, with the exception of a few "blues"—*alcon*, *pheretes*, *donzelii*, *orbitulus* and *optilete* (*eros* absent on the Mattmark road this year), I added but little to my knowledge or my cabinet. Crossing over to the Fribourg side at the end of the month, in the neighbourhood of Bulle, I found only common lepidoptera on the wing, *Zephyrus betulae* in the beech woods about Gruyères, *Pararge hiera* and *Polyommatus bellargus*, of which I saw one day when I had no net, a beautiful specimen of the ab. *ceronus*. My advice to the collectors who can choose their time for Switzerland, is, therefore, to go early, when the hotels are less crowded, and mountain species more abundant.—H. ROWLAND BROWN, M.A., F.E.S., Oxhey Grove, Harrow-Weald.

TANAGRA ATRATA AND PHORODESMA PUSTULATA AT BRONDESBURY.—In June last I obtained a specimen of *Tanagra atrata*, at Brondesbury Station, and on the evening of June 30th, a fine, fresh specimen of *Phorodesma pustulata* flew in to light at my bedroom window.—L. J. TREMAYNE, 51, Buckley Road, Brondesbury.

NOTES FROM CARLISLE.—July was a poor month for lepidoptera. Of butterflies, *Enodia hyperanthus* was abundant, *Pamphila sylvanus*, *Polyommatus icarus*, and *Hipparchia semele* moderately so, but though I worked hard on two occasions in glorious butterfly weather for *Argynnis aglaia*, I only captured four specimens. After sunset, *Hepialus velleda* and *H. sylvanus* occurred in fair numbers. In one locality the ab. *gallicus* of the former predominated. At light the following occurred:—*Agrotis nigricans*, *Charaxes graminis*, *Pelurga comitata* and *Eupithecia oblongata*, all in limited numbers. At

flowers of ragwort, *Miana bicoloria* was one of the few Noctuids which was common this season. "Sugar" was useless. Night after night there was nothing to box; even *Triphaena promba*, *Xylophasia monoglypha* and *Apamea didyma* were rare. Dusking for Geometrids also gave poor results; *Eubolia* (*Ortholitha*) *limitata* and *Hyppis sordidata* were the only species which occurred at all freely. *Eustroma pyraliata*, *Acidalia fumata*, *A. aversata* and *Ellopiopsis prosapiaria* were represented by a specimen or two each, while *Uropteryx sambucaria* was more frequently seen than captured. *Lithosia mesomella*, as usual, swarmed in its favourite damp haunts. It is the only "footman" I get here. A slight improvement was noticeable in August, particularly in the Geometrids; *Cidaria immanata*, *Eustroma fulvata*, *Acidalia bisetata*, *Larentia didymata* and *Melanthia bicolorata* abounded. A few fine *Coremia unidentaria* were also taken, and one very worn *Eustroma prunata* was netted. This is only the second specimen I have met with. In woods, the beating stick dislodged *Eustroma testata* in plenty. At light, *Luperina testacea* and *Noctua xanthographa* were the prevailing species, and occasionally *Hydroecia micacea* turned up. *Polia chi* was in tolerable plenty on walls, but I did not observe any aberrations. It is a very constant species round Carlisle. "Sugar" was no more attractive than in July, a single *Triphaena fimbria* being the only thing worth mentioning. There are few butterflies here after July. *Pararge megaera* was common in lanes, and a few *Pyrameis cardui* were observed. With September, "sugar" began to pay, and up to the time of writing is yielding some useful Noctuids. *Hadena protea* and *Anchoecelis litura* have been common, especially so on two frosty moonlight nights. On dull, close evenings, there were not nearly so many, which is the reverse of usual experience. Other species I am now taking are: *Anchoecelis helvola* (*rufina*), *A. limosa*, *Noctua glareosa*, *N. castanea* (worn), *Miselia oxyacanthæ*, *Citria* (*Xanthia*) *flavago*, *C. fulvago*, *Epura nigræ*, *Amphipyra tragopogonis*, *Gonoptera libatrix*, and one or two others. None of these are common, but still the result of an evening's treacling, at the present time, is much better than during any other part of the season. *Tapinostola fulva* is now flitting about in damp meadows after sunset; *Plusia gamma* is more in evidence than I have noticed it for some years. It was a new experience for me to see four specimens of this species at "sugar." I have never seen a *Plusia* attracted by sweets before. Larvæ have been very abundant lately. On the osiers, which fringe our small streams, *Smerinthus ocellatus*, *S. populi*, and *Cerura vinula* have been taken freely. A few *Notodonta sicæ* and *Gonoptera libatrix* occurred on osier and willow, and I met with *Cerura furcula* for the first time. Wherever the white campion grew, larvæ of *Dianthoecia capsicola* swarmed in the seed-pods. In one district almost every oak tree harboured a brood or two of *Phalera bucephala*. Larvæ of *Pyrameis atalanta* were more numerous than they have been for some years. In gardens, *Hadena oleracea* and *Mamestra brassicæ* are now swarming, while *Spilosoma menthastri* and *S. lubricipeda* are revelling on the leaves of rhubarb. Wherever I go these last two larvæ are to be seen, scurrying over road and pavement, in quest of suitable places for pupation. My non-entomological friends bring them to me daily as something novel. From flowers of foxglove I took a few *Eupithecia pulchellata*, but all were ichneumonated.—F. H. DAX, 6, Currock Terrace, Carlisle. September 15th, 1897.

The Entomologist's Record

AND

JOURNAL OF VARIATION.

VOL. IX. No. 12.

DECEMBER 15TH, 1897.

Notes on hybrid *Smerinthus populi-ocellatus*.

By A. BACOT.

After many trials, in different seasons, I was at last, in June, 1896, fortunate in obtaining two pairings between *Smerinthus populi* and *S. ocellatus*.

OVUM.—Early in June I found, in one of my cages, a male *Smerinthus populi*, in copulâ with a female *S. ocellatus*. One hundred and seventy-eight eggs were laid by the ♀, and, although some slight colour changes took place, none of them hatched. Many turned dark before shrivelling up, and, since infertile eggs of *Smerinthus* do not change colour, but remain green even after drying up, whilst fertile eggs become whitish before hatching, it is very probable that a certain amount of development took place within the eggs.

On June 13th, a male *S. ocellatus* paired with a female *S. populi*. As I was leaving London for a week on the 19th, I handed the eggs over to my friend Mr. J. A. Simes, who kindly took charge of them during my absence. He informs me that they commenced to hatch on the 24th, and, upon my return on the 27th, there were twenty-eight living larvæ and a number of dead ones; a few more hatched after this date, but they were very weakly, and soon followed the majority. A careful examination of the ova, on July 3rd, showed that of 163 eggs laid, 59 had hatched, in 55 the young larvæ appeared to have fully developed, but from some unexplained cause had not emerged; 27 were still green (these afterwards dried up), and of the remainder some were very discoloured (having probably died during the development of the embryo), and others had shrivelled up without change (probably unfertilised).

LARVA.—June 29th, 1st skin: length between one-eighth and three-sixteenths of an inch when newly hatched, growing to between three-eighths and seven-sixteenths before the first moult. *Head*: green, large, rounded, but with a tendency to triangular shape; a few scattered hairs and a yellow inverted V on face. *Body*: pale green; scutellum fairly distinct; a faint dark, medio-dorsal line; two tubercles on the dorsal area of the thoracic segments can be distinguished as rather larger, and bearing longer hairs than the usual shagreen tubercles. The trapezoidals on abdominal segments can also be observed standing out among the shagreen tubercles, though not quite so clearly as the two above-mentioned on the thoracic segments. (This last feature is not distinctive of the hybrid larvæ; it can also be seen in the larva of *S. ocellatus*, and is probably present in that of *S. populi* and *S. tiliae*.)

I merely call attention to it as an important point that I had not previously noted.) Seven oblique stripes are present, the seventh being rather stronger than the rest; the sub-dorsal lines distinct. All the stripes are more conspicuous after the larva has been feeding for a few days. *Caudal horn*: long, pale pink; some of the larvæ have only short horns, which appear withered (in one instance almost to the stump), in another it is almost entirely absent, while a third has the horn constricted just above the base, as though a piece of thread had been tied round it. I have noticed a similar deformity to this last in a larva of *S. tiliae*.

Unfortunately, I had no larvæ of either *S. ocellatus* or *S. populi* in the first stage with which to compare, but, judging from memory and written descriptions, I noted as follows. The larva closely resembles that of *S. ocellatus* in shape and attitude, as well as in markings.

July 3rd. Most of the larvæ are now in 2nd skin, and are growing rapidly. July 4th. By this time I had larvæ of both *S. ocellatus* and *S. populi* in the same stage as the hybrid larvæ, so that the comparisons in this and subsequent stages are more exact. *2nd skin*: length three-eighths to five-eighths of an inch. *Head*: triangular, broader, less tall and pointed than in larva of *S. ocellatus*, but not so bulged at cheeks nor squat as in that of *S. populi*; yellow tubercles at apex of head taller than in the latter species. *Body*: scutellum indistinct; the sub-dorsal stripes are continued faintly across the oblique lines to the 5th (in one larva to the 7th); the medio-dorsal line is produced by the absence of shagreen tubercles; dark borders to oblique lines are present. The stripes are stronger than in *S. populi*, but not so marked as in *S. ocellatus*. In addition to the other stripes there is a faint lateral line below the sub-dorsal, on the thoracic segments. *Caudal horn*: the base is pink for about one-third its height; shorter and lighter in colour than that of *S. ocellatus*, though more marked in both respects than in larva of *S. populi*. *Habits*: The larva retracts the first two pairs of fore-legs (in one larva the third pair also); I did not note any marked preference for either the upright or hanging position in this stage; but one larva assumed a rather marked "sphinx" posture, very like that of *Sphinx ligustri*.

A careful examination of the larva proves it to be curiously midway between the parent species as regards most of the important differentiating characters. In shape and coloration it is neither so white a green nor graceful in form as the larva of *S. ocellatus*, nor is it so yellow-green and heavy-looking as the larva of *S. populi*. Looked at in a less critical manner, and without the aid of a glass, it reminds one most of the yellow form of *S. ocellatus*. Its habits and position, also, show rather more trace of the ♂ than ♀ parent. The fact of the 1st pair of oblique stripes being no stronger than the 2nd to 6th pairs, and weaker than the 7th, still further adds to its resemblance to *S. ocellatus*.

3rd skin: July 8th. *Head*: As before, nearly midway between the parent forms in shape, etc., but it now resembles *S. populi* more nearly than *S. ocellatus* in size, colour and roughness, being covered with yellowish tubercles, which are only very small in the larva of *S. ocellatus*; the large tubercles at apex are only slightly larger than in the larva of *S. populi*, with which they agree as regards colour

(yellow) ; they are, however, situated, as in *S. ocellatus*, close together, and not a short distance apart with two smaller ones between, as is the case in the larva of *S. populi*. *Body*: becomes paler towards close of this stage, though not so white as *S. ocellatus*. *Stripes*: oblique stripes, as in *S. tiliæ* and *S. ocellatus*, 1 to 5 equal, 6 narrow and weak, 7 strong and broad. The sub-dorsal line is faint and narrow, is continued backwards to the 7th oblique, but barely noticeable on thoracic segments; a double medio-dorsal stripe is faintly marked; the anus outlined with same colour as other stripes. *Caudal horn*: long and very thick at base. *Hairs*: still bifid, but this character is not quite so marked in the hybrid as in the larva of *S. ocellatus*. *Habits*: the larvæ rest either with the head downwards (*S. populi* habit) or with it upright (*S. ocellatus* position), with the first two pairs of fore-legs withdrawn, though not so completely as is the case in *S. ocellatus*.

One larva is growing to a large size in this stage, it is already over one inch long, and shows no sign of an approaching moult. The larva of *S. ocellatus*, when about to moult in this stage, is of about the same length as this larva now is, but it is not nearly so bulky. By July 12th there were only 19 living larvæ; three were well grown in the 4th skin, the remainder mostly in 3rd. They varied in colour from a yellow-green to a pale whitish sage-green, and were tolerably constant in shape, but very variable in size.

4th skin: July 12th. *Head*: as previously described. *Body*: the 7th oblique stripe is faintly continued forwards to the 3rd pair of pro-legs; the 1st oblique runs forward to the pro-thorax. The small oblique stripes that are present in *S. populi*, just above base of pro-legs 1, 2 and 3, can be faintly traced in the hybrid larva. The larvæ now mostly rest in the position taken by that of *S. populi*. Both yellowish and whitish forms are present in this stage. Just after the 3rd moult the yellow forms are superficially very like *S. populi* in its 3rd skin, the only striking difference being the absence of any strengthening of the 1st oblique stripes. *July 17th*. One is now nearly full grown, in 4th skin, while the majority of the remainder are about to undergo a 4th moult.

FULL-FED LARVÆ IN 4TH SKIN, July 17th.—*Head*: not so large or tall as that of *S. ocellatus* in 5th skin, and the yellow bands down the sides of the face are stronger and broader. The resemblance of the tubercles, and their position on apex, is remarkably close to *S. ocellatus* in everything except colour. This is, however, partly due to the fact that with *S. ocellatus* in the adult stage (5th skin) the tubercles or processes have greatly dwindled in size. *Body*: in colour it now almost exactly resembles a typical larva of *S. ocellatus*. The oblique stripes are now much stronger than when it first changed into this skin; the sub-dorsal is very weak and faint; the spiracles, bright red; in *S. ocellatus* they are deep crimson, and much larger. Anal flap outlined with yellow, in *S. ocellatus* with white. In general shape and habits it is still very similar to *S. populi*, and is restless under examination, as in this species. The larva of *S. ocellatus*, on the other hand, will usually retain its stiff and rigid resting position during the process, unless greatly provoked.

The first larva went down on July 21st, having only undergone three moults. By the 24th, the majority were full-fed, or nearly so, and the remainder, with one or two exceptions, were in the final stage.

So far as I was able to follow them, the majority had four moults, a few only attaining their full growth in the 4th skin.

The following are the CHIEF POINTS OF DIFFERENCE BETWEEN ADULT LARVÆ OF THE HYBRID AND THOSE OF *S. ocellatus*.—*Head*: smoother, and not so pointed; yellow lines down face much broader. *Body*: not so long and graceful; the sub-dorsal stripes much weaker; the oblique stripes not so strong; slight traces of small oblique stripes just above the bases of prolegs 1, 2 and 3 (these are altogether absent in *S. ocellatus*). *Caudal horn*: yellowish at upper end. *Spiracles*: not so large or dark; 1st and 2nd pairs of prolegs are retractile, but to a less extent than in *S. ocellatus*. Resting habits differ as a rule.

DIFFERENCES BETWEEN THE LARVA OF THE HYBRID AND THAT OF *S. populi*.—*Head*: taller and more pointed. *Body*: longer, and not so dumpy. *Oblique stripes*: rather broader. As in the larva of *S. ocellatus*, the stripes are due rather to colour than structure; the 1st no stronger than the following—2nd to 5th; the 7th runs forward to front of 4th pair of prolegs (as in *S. ocellatus*). Small oblique lines above base of prolegs present, but much fainter than in *S. populi*. *Caudal horn*: sky-blue in colour at base.

In its general appearance the larva, in the 1st and 2nd stages, approaches *S. ocellatus* rather than *S. populi*; in 3rd and early part of 4th stages it has a greater resemblance to *S. populi*; when full-fed it veers back again towards *S. ocellatus*.

A very similar change takes place in the larval life of *S. populi*, though perhaps this is not quite so marked as in the hybrid. It is in the middle stages (2nd and 3rd) that this larva attains its greatest distinctiveness; in the first and last stages the difference between it and the larva of *S. ocellatus* not being nearly so sharply contrasted, and this departure and return is in no way due to the development of *S. ocellatus*, which does not greatly differ in appearance throughout its ontogeny.

In the shape and structure of head, and the markings on its body, the hybrid larvæ were remarkably constant. I looked with especial care for any individual variation or difference in the oblique stripes; which it seemed not unlikely might vary in the direction of *S. populi*, by a strengthening of the 1st, but in no case was there the slightest tendency in this direction.

Throughout my notes I have made comparisons between the hybrid larvæ and those of the parent species, but with some characters the agreement with *S. tiliæ* is as close as, or closer than, that with *S. ocellatus* and *S. populi*, and where this agreement is present, as, for instance, in the colour of the processes at the apex of head, we have, I think, conclusive evidence that this was their original appearance.

The larvæ were very delicate, more especially during the early stages, the moulting periods being the most critical of all. The less robust appeared to have great difficulty in getting rid of their old skin; I assisted them off with their old clothes in several instances, but, alas, in no case did my help prove of any avail, for they died in spite of my philanthropic efforts.

I suspect the difficulty really consists in drawing out the old linings of the tracheæ, the rough assistance one is able to render probably results in breaking them away from their attachment to the old skin, and leaving them to clog the breathing apparatus.

(To be continued).

Spring Lepidoptera at Hyères in 1897.

By (Rev.) C. J. BUCKMASTER, M.A.

I arrived at Hyères on April 28th last, left May 10th; stayed at the Gr. Hotel, Costabelle. On May 7th, there was a strong mistral, the other days were mostly fine—some of them very hot, with a maximum shade temperature of 80° F. The season appeared to be a decidedly forward one. I collected chiefly in the neighbourhood of Costabelle, on the wooded hills and among the quarries, but paid two visits (April 29th and May 8th) to Le Paradis, and one visit (May 5th), to the cork woods north of Hyères. The following species were captured:—

HESPERIDES: HESPERIDÆ.—*Spilothyrus alceae*: five (first on May 1st); Quarries. *Syrichthys sidae*: a pair in the Cork Wood Valleys, May 5th. (The heat here was intense, and after enduring it for about an hour, I had to regain the ridge for a breath of air). *S. sao*: pretty common throughout the district.

PAPILIONIDES: LYCENIDÆ.—*Callophrys rubi*: A few at Le Paradis, April 29th, but very worn. (No sign of *Thestor ballus*). *Chrysophanus alciphron* var. *gordius*: a lovely violet male, at Costabelle, May 7th. The day following, at Le Paradis, I took males with scarcely any violet suffusion, as well as females. *C. phlaeas*: a few noticed towards the end of my stay. *Lampides telicanus*: one very battered specimen, at Le Paradis, May 8th. I can find no record of so early an appearance of this species. Could it be a survivor from the late autumn brood? *Polyommatus baton*: two worn specimens, both males, at Le Paradis, April 29th. None seen there at my second visit. *P. astrarche*: a few. *P. icarus*: a few of both sexes, indistinguishable from my Swiss examples; no ab. *icarinus* observed. *P. corydon*: a few of both sexes. *Cyaniris argiolus*: one worn female only (May 8th). *Nomiades cyllarus*: the commonest blue throughout the district. My series consists of twenty males and two females. Size 1-1·3 in.; tone of colour varies from that of *P. escheri* to that of *P. icarus*. Underside is usually pearly grey, but in several specimens it is darker, approaching the brown of *N. melanops*. The powdering of the wing-bases is decidedly greenish-blue, but I can detect little or no trace of it on the fore-wings. The distinctive spots on the underside of the fore-wing are by no means constant; in some specimens they scarcely increase in size towards inner margin, and are inconspicuous. The row of small spots on the underside of the hind-wing is, in some specimens, completely effaced (the same specimens showing a corresponding tendency with regard to the spots of the fore-wing). In one example these hind-wing spots are complete on the one side, and wholly effaced on the other. *N. melanops*: four specimens, in poor condition, in company with *P. baton*, at Le Paradis, April 29th, not seen again. *Cupido minima*: one, at Le Paradis, May 8th.

PAPILIONIDÆ.—*Papilio podalirius* and *machaon*: Neither very common, and mostly in bad condition. I noticed their habit of flying round hill-tops at Le Mont Paradis. *Thais medesicaste*: a few, in a hollow in the Costabelle Woods, May 1st-4th, in good condition.

PIERIDÆ.—*Aporia crataegi*: Several taken in the Cork Woods, May 3rd and 5th. *P. brassicae* and *rapae*: the first butterflies I noticed on

April 29th, well out and common. *P. daplidice*: pretty common, but could not find any of the var. *bellidice*. *Anthocharis belia*: only five set, but believe it was pretty common. I confused this species at the time with *E. cardamines* ♀. *A. tagis* var. *bellezina*: what looks like a very diminutive *A. belia* is probably referable to this species. I took it on May 7th, and thought at the time that I had got *bellidice*. *E. euphenoides*: a nice series, including two females. Found it commonest in the Costabelle Woods, on May 1st, after which it became scarcer. *E. cardamines*: not so common, nearly all females. *Leucophasia sinapis*: common, the shading of the underside of the hind-wings does not appear any darker than in that of my British or Swiss specimens, but the tone is decidedly *yellow*. *Colias edusa*: seen several times. *Gonepteryx cleopatra*: not very common, and all worn. (This was a great disappointment to me on my first visit to the south).

NYMPHALIDÆ: *Limenitis camilla*: Fairly common throughout the district, and in beautiful condition (fond of settling on foliage). *Erygonia polychloros*: one or two seen. *Euvanessa antiopa*: only one specimen seen, April 29th, and that a mere wreck. *Melitaea didyma*: rather common, and not more "fiery" than my Swiss examples. *M. cinaria*: commoner than the last, getting rather over. (I have not met with this species in Switzerland). *M. phoebe*: one taken on April 29th. *M. parthenie* (?): two specimens, large and fine. *Brenthis euphrosyne*: Several. *Melanargia syllius*: first seen on May 2nd, afterwards generally common. *Pararge megera* and *egeia*: both fairly common, but worn. *E. janira* var. *hispulla*: males pretty frequent, but difficult to catch on the steep wooded hill-sides—one female, May 8th. *E. pasiphae*: a fine series, first seen above Hyères, on May 4th, afterwards occurring generally. *C. pamphilus*: one noticed on May 5th.

Among the very few MACRO-HETEROCERA noticed were the following:—*Zygæna lavandulæ*: Pretty common on May 1st, booming about from flower to flower, on the summit of one of the hills behind Costabelle, and almost insensible to the effects of the cyanide bottle. *Acontia lucida* and *luctuosa*, *Erastria numerica*: single specimens. *Metoptria monogramma*: rather common; woods and quarries.

Melanic and intermediate aberrations of *Abraxas sylvata* (ulmata) in Yorkshire.

By WILLIAM HEWETT.

During the present season melanic forms of *A. sylvata* (*ulmata*) have been by no means rare in one particular locality in Yorkshire, and I have secured a number of these, as well as many intermediate aberrations, as the result of four visits paid to the district this season. Messrs. Maddison, Head, Walker and Dutton, have also obtained these aberrations in some numbers. None of them have been obtained from larvæ collected in the neighbourhood of York, as stated by one of your contemporaries, but all were secured in the imago state, occurring amongst the typical form which, in this particular locality, is found in profusion. I kept a number of melanic females (principally cripples) for eggs, which several deposited. The majority of these were fertile. Dr. Riding very kindly undertook to rear them, and, in a letter dated August 24th, says:—"I am glad to be able to write that almost all the *Abraxas sylvata* (*ulmata*) have gone down; there have been three or

four pupæ on the surface, so there is little doubt but that the others that have disappeared into the cocoa fibre have pupated also. There are about ten larvæ still feeding, and I think altogether I have not found half-a-dozen dead ones. Not one 'spun a web in the tree' as stated by Stainton to be the habit of the genus *Abraxas*." I may add that Dr. Riding fed the larvæ on wych-elm. We are now looking forward to the rearing, for the first time, melanic forms of *A. sylvata* (*ulmata*) from the egg.

The history of these forms in this locality may prove interesting: Messrs. Head, Walker and myself have each collected in the locality for years, more especially whilst *A. sylvata* (*ulmata*) has been out, and although we have each made special search for aberrations, not one of us had ever observed a melanic specimen in this locality prior to the present year. The simultaneous appearance of a considerable number of this particular aberration in the same locality will, I firmly believe, save this fine aberration from the danger of being swamped by intercrossing, and completely refutes Professor G. J. Romanes' statement, *viz.*, "That the same variation does not occur simultaneously in a number of individuals inhabiting the same area, and that it is mere assumption to say it does." He further adds: "If the assumption were granted there would be an end of the present difficulty," *viz.*, the swamping effects of intercrossing, "for if a sufficient number of individuals were thus simultaneously and similarly modified, there need be no longer any danger of the variety becoming swamped by intercrossing." I do not believe there is any danger of this variety being swamped, but confidently look forward to its occurring in still greater numbers next season, and that intermediate forms will also be much more numerous.

Melanic forms of this species have only previously been recorded from Edlington Wood, Doncaster, where they are of extremely rare occurrence; I took one there some six years ago. I am also aware of its occasional occurrence at Drewton Dale, Yorkshire, and have in my collection a specimen of this aberration from that locality, obtained in 1895. Unfortunately, a large proportion of the melanic forms were cripples, or partially so, especially the left fore- and hind-wings. [Recorded also from Bamford Wood, near Rochdale, by Bentley, June 22nd, 1880.—Ed.].

Aberrations of *Abraxas sylvata* (*ulmata*).

By J. W. TUTT, F.E.S.

In the *Entom. Record*, ix., pp. 268-269, Mr. Dutton records the capture of some aberrations of *A. sylvata*. These, I understand, were captured in a well-known locality, for this species, in Yorkshire, some twenty to thirty miles from the city of York. As he sent a picked selection of his captures for me to exhibit at the meetings of the various London Entomological Societies, I made the following notes on the specimens.

The specimens may be described as follows: (1) *Three* of the specimens are almost unicolorous, dark slaty-grey in colour, but with typical brown markings; the bodies are black. (2) *Two* of the specimens are uniformly dark slaty-grey, with the brown patch at the anal angle of the hind-wings, the patch on the inner margin of the fore-wing, and the basal area of the fore-wing, replaced by a dull greyish patch, tinged with ochreous; the bodies are black. (3) *One* specimen, similar to those first described (1), but with a series of pale longitu-

dinal streaks just within the normal肘ed line; the body is black. (4) *One* specimen of a pale slaty-grey ground colour, with normal brown markings, parallel to those first described (1), but with paler ground colour; body almost black. (5) *One* specimen of the same form, with a clear, but narrow, white costal and inner margin to the fore-wings, and a white inner margin and pure white fringe to the hind-wings; the body suffused. (6) *One* specimen of the same form as those first described (1), but with whitish base to fore- and hind-wings; the body suffused. (7) *One* specimen with the outer margin of the left fore- and hind-wings dark grey, the right side normal. (8) *One* specimen with the hind-wings only, pale slaty-grey, and with the centre of the brown anal spot of hind-wings, and the inner marginal blotch of fore-wings, grey. (9) *One* specimen with the fore- and hind-wings with a series of longitudinal grey markings running along the sub-dorsal areas of both wings. (10) *One* specimen with the discoidal blotch continued as a band across the fore-wings; the outer (sub-dorsal) band also very strongly marked. (11) *One* specimen with the two transverse bands mentioned in the description of the last aberration (10) united into a broad band across the fore-wings.

The above aberrations are all more or less suffused with slaty-grey, or exhibit an extension of the normal slaty-grey or blue-grey markings. The following individuals, sent by Mr. Dutton, were suffused with dusky ochreous, or dirty cream-colour.

(1) *One* specimen with the ground colour of both fore-wings suffused with smoky cream colour; the hind-wings normal. (2) *Two* specimens, one with the right, the other with the left, fore-wing similarly suffused; the other three wings, in each case, normal. (3) *One* specimen with the fore-wings and the right hind-wing suffused at base, the dark-brown spots ill-developed, and the normal brown hue of these spots wanting. (4) *One* specimen with the left fore-wing dull smoky, the other three wings normal.

A single specimen presented the normal coloration, but had the dark brown spots and grey shades much reduced below the normal limit.

Porritt (*List of Yorkshire Lepidoptera*, p. 43) writes: "A peculiar lead-coloured form sometimes occurs, and many other beautiful aberrations have been taken. Edlington Wood is noted for aberrations of this species." At the meeting of the Entom. Soc. of London, on October 6th last, when Mr. Dutton's specimens were exhibited, he further remarked that melanic aberrations were not unusual, but that it was very exceptional for a large number to occur in any one year, as had been the case during the last summer.

Mr. Dutton (*ante*, p. 269) suggests that this unusual appearance of what is usually a rare form of aberration, is probably due to the malnutrition of the larva. This view is strongly supported by the fact, mentioned both by Mr. Dutton and Mr. Hewett, that a more or less large proportion of these forms were crippled, some having quite stumpy wings, others with only two wings moderately developed, and so on. Even the best of the specimens, so far as those exhibited allowed one to judge, had more or less crumpled wings, that had been flattened out by the setting brace.

One fact was very evident from the specimens examined, *viz.*, that the suffusion was not due to the spread of the normal slaty-grey

shading on the wings, for, in the less deeply suffused specimens, these markings stand out distinctly, although in the darkest they are very inconspicuous or entirely lost in the ground colour. The intermediate stages also show that the darkening of the ground colour does not develop by the spread of the already existing slaty-grey blotches, but that it is a general modification of the scale structure which results in suffusion, the fact that the suffusion is of the same hue as the normal shading being quite fortuitous. It appears to be, in this respect, exactly parallel with the suffused aberrations of *Arctia villica*, *Nemeophila plantaginis*, etc., in which the normal ground colour is changed to a suffused black, through which the normal black spots show quite distinctly.

The poor physique of these aberrations suggests that, whether the crippling was the result of the larva being ill-supplied with food, or of some unfavourable condition to which the pupa was subjected, the prime factor in the production of these aberrations is one that spells "death" to the race, and hence this particular form of aberration is not likely to occur continuously in any great numbers. It may occur from time to time, even in abundance, if it be a species so easily and rapidly affected by external circumstances, as this extensive appearance suggests. If so, it is certainly a species for Mr. Merrifield's special attention.

On the other hand, in a district such as that where these specimens were captured, in which melanism would probably be useful to such a species as this, there might be sufficient cumulative force for heredity to produce such a race, but as this could only be done by means of the more vigorous specimens of the suffused form, the process would necessarily be a slow one.

I only know of one fact that makes me hesitate to accept the malnutrition of the larva as the direct cause for this sudden appearance of suffusion in so many specimens of this species, and it is, that I have on two or three occasions received larvæ from this locality and Edlington Wood, starved them most systematically, and never got a suffused variety, although the specimens only emerged about two-thirds the normal size. If it is not the food-supply that reduces the energy, and results in producing cripples and suffusion, what is it? Experiment is needed.

To make these aberrations recognisable without a separate diagnosis each time one is recorded, the following varietal nomenclature is suggested:—

1.—With the whole of the wings and body suffused with paler or darker slaty-grey = *ab. suffusa*, n. ab.

2.—With the wings, or some part of the wings, irregularly or unequally suffused with slaty-grey patches = *ab. intermedia*, n. ab.

3.—With the wings, or part of the wings, suffused with dirty ochreous or cream-colour = *ab. obscura*, n. ab.

4.—With the discoidal and central slaty-grey shades forming a central transverse band across the fore-wings = *ab. transversa*, n. ab.

Coleoptera in the winter.

By CLAUDE MORLEY, F.E.S.

By the end of October, the ivy blossom is over, and we have taken our *Xanthias* and our *Thorns*, and searched in vain (as usual) for our

Erythrocephalas and our Lambdas, and what are we going to do now? Are we going to sit down and arrange our cabinets for next season, varying the programme with occasional rambles in search of the twenty-odd species, many of them of the commonest, that alone are obtainable by the Macro-lepidopterist? Or shall we not rather expand our knowledge of this wonderful science of ours, and look more closely into those marvellous and, to us, perhaps somewhat contemptibly tiny beings, which go to make up the order COLEOPTERA? If we sufficiently bestir ourselves to do this, we shall very soon find that our erstwhile contempt was born, as is too often the case, not from the exquisite little creatures themselves, but from our own ignorance of this, one of the greatest and most varied of the British orders of the Insecta. The great advantage of the study of this order is that there are as many specimens, and perhaps even better species, to be obtained during the "closed season" of winter, than in the bright and genial warmth of the most glorious summer weather. This, in all probability, is not in reality the case, but only appears to be so, since many things abounding in May and June will be seen at no other time of the year, the majority, on the other hand, carry on a very spirited existence from the end of one August to the commencement of the next, thus living very much longer in the imago state than do any of the Lepidoptera, not excepting the hybernators.

A country ramble in November or December becomes a thing of some monotony to the lepidopterist, at all events in England, since his eye travels only from tree-trunk to paling and back—that is to say, of course, when searching for imagines. In pursuit of beetles—also imagines—however, there is not an object throughout a country lane which may not harbour "good things." The very earth of the hedge-bottoms teems with them, and the twigs of the hedge-tops afford great security against the inclemencies of the weather to the enclosed insects. The scattered leaves form a perfect hibernaculum, and the very palings are sometimes riddled, much to their detriment, by the borings of various *Teredilia* and *Scolytidae*. One of the very best ways of collecting in the autumn is from fungi. Many exceedingly rare things are to be obtained by visiting a wood—I always think fungi in woods the best kinds for this work—and shaking any pieces of fungus, which you will find the recent rains have caused to spring up abundantly on every side, over anything you happen to have with you, such as an umbrella, newspaper, sweep-net, or even one's pocket-handkerchief which answers the purpose very well and will always wash! The beetles principally taken by this means are *Brachelytra*, among which will be large numbers of *Homalota*, the largest genus of British Coleoptera, and one of the most difficult to identify, but besides these will be found a fair percentage of *Clavicornia*, with a sprinkling, perhaps, of *Geodephaga* and *Teredilia*.

Later, when the fungi have all disappeared, and the iron hand of winter has descended in stern reality, we may still wend our way, chisel in hand, to some lordly poplar or regal beech, and there spend a happy afternoon beneath an overcoat. For many of our very rarest beetles hibernate under the bark of trees, while others, being internal feeders upon the actual wood itself, do not, like the larva of *Cossus*, hibernate at all, but carry on their depredations, which thus become doubly injurious, throughout the whole year. I well remember spend-

ing three hours continuously cutting *Hylesinus crenatus* from the solid wood of a very tough and apparently quite healthy oak tree, with the temperature at 34°, and a keen nor'easter driving the sleet into my eyes with delightful persistency; but I took my series, and returned home rejoicing, under the shadow of a pipe, to a good hot tea! Mr. Woolley and many other coleopterists rave about beech as the best tree for winter beetles, and I should like to do so too, but there are none in these parts, saving such as stand in gardens or other too well cultivated spots. Personally I have always found willow trees best, for, if there is nothing especially choice, one at least gets a great number and often a fair variety of things; those trees which stand on the banks of streams should be worked with greatest success, since the semi-aquatic beetles, such as the *Prasocures*, invariably walk up something tall in order to avoid "February fill-dyke," and floods generally, and would in this respect appear wiser in their generation than *Chaerocampa elpenor*, most of whose pupæ must surely be drowned, as they lie among the lady's-bed-straw, in our flooded water-meadows, for perhaps six weeks or so.

Floods, by-the-bye, are the cause whose effect is another pabulum much affected by beetles, but this is generally after the new year has set in. The refuse, left upon the meadows by the sinking again of the waters, has been washed from the river-banks, surrounding ditches, and, in fact, whencesoever the flood was able to sweep it. This will be found a most prolific beetle-trap, and one that may be carried away in a sack or bag, and brought home for diligent examination, which is quite impracticable in the field, owing to the exceedingly minute species it invariably contains. Last February I took over a hundred and fifty species from a single bag of this rejectamenta, amongst which were twenty-three specimens of the very rare *Trachys troglodytes*, and, a day or two later, the fourth (I believe) British specimen of *Bagous diglyptus*, having taken the third at about the same spot a year previously. Bags of moss may be brought home in like manner from anywhere with good results, but preferably from the open places and glades in woods, and will be found to contain many rare things it is hardly possible to obtain, excepting by the merest chance otherwise. *Philonthus lucens*, one of our rarest species of the genus, is obtained almost exclusively by this means.

When in the transition stage between moths and beetles, I brought home a bag full of dead leaves from a spinny at Epsom, and was exceedingly elated to find curled up great numbers of *Otiorrhynchus picipes*, which I carefully carded and sought diligently to identify. I was equally fortunate in the other order, Lepidoptera, which showed up some half-dozen larvæ of *Noctua xanthographa*! Mr. Ford reminds me that about Christmas, or soon after, the water-net may be brought into requisition with advantage, if the winter be an open one, as good *Hydradephaga* and *Palpicornia* are beginning to emerge in our ponds and ditches, and by the middle of February the majority of those species which occur ubiquitously should be in full swing; but it is hard to specify a time for any particular species, for, though they undoubtedly emerge from the pupa in rotation year by year, no section of the Coleoptera is probably affected more by atmospheric influences. Altogether the coleopterist has a rather gay time in the winter, never feels that he cannot obtain new species to add to his collection

simply by going out into the highways and hedges and culling them in by judicious working, and, moreover, the subject is so much wider (I am speaking of British insects), and the scope for experiment so very much greater, as to be extremely fascinating to those ambitious enough to tread its varied pathway.

Notes on the Rhopalocera of the Guildford district during the years 1896-7.

By W. GROVER.

The year 1896 was a somewhat abnormal one. In many localities the season was (as had been anticipated from the mildness of the winter) unusually forward; but, in others, the reverse was the case, the present district being numbered among the latter. Although the winter here was one of almost unprecedented mildness—both frost and snow being practically an unknown quantity—the spring species were later than usual, and from three weeks to a month later than in 1893, although the conditions were of much the same character as in that year. The long drought, which lasted practically from the beginning of April to the beginning of August (when both it and the summer came to a sudden termination), was, in many respects, very similar to that of 1893, but in 1896 the weather broke up suddenly in the first weeks of August, and after that, fine sunny days were very rare indeed. This, no doubt, accounted for the failure of some of the autumn species, more particularly the Vanessids, the almost total absence of which was the more noticeable after the wonderful abundance of so many other species during the long, dry summer.

On the other hand, 1897 must be considered in many ways a typical year, the winter being rather severe, compared with the previous one, but remarkable more for excessive rainfall than cold; and the summer showing to perfection that wonderful mixture of heat and coolness, sunshine and storm, which no other country in the world can show in the same degree as our own islands. The climatic conditions being so different, it is only to be expected that the lepidopterous fauna would show equal points of divergence, and the present year will chiefly be remembered for a late spring, and an unusually fine and sunny autumn, and also for the general scarcity of individuals of many species.

The district covered by this article is a strictly local one, being only that portion included within a radius of four miles from the town.

The geological formations of the district are both numerous and interesting, for so small an area, as will be seen from the following list, taking them in order from north to south: I. Lower Bagshot, sand, with patches of gravel and peaty bog. II. London clay, with extensive patches of Pleistocene sand and drift gravel; these, in some places, cover the clay to a depth of nearly fifty feet. III. Woolwich and Reading beds; these are only developed to a small extent. IV. Chalk, with a capping of clay and gravel (high-level drift) in many places. This formation occupies the central portion of the district, the town itself being situated upon it. V. Upper greensand. VI. Gault. The extent of both these is here very small. VII. Lower greensand (Folkestone and Hythe beds). These are both developed to a large extent, more particularly the Hythe beds. There is also a

large inlier of Atherfield and Wealden clay in the latter; it is somewhat triangular in shape (the Wealden occupying the centre), and is nearly five miles in length from east to west, and about two in width at its widest part.

As may be gathered from the above, the physical geography is equally diversified. The river Wey flowing towards the N.N.E., intersects the district, dividing it into two nearly equal portions. The small portion of Bagshot sand included within the northern boundary of the district is low-lying land, being only a little over 100 feet above sea level; some portion is under cultivation, but the largest part is boggy moor. The London clay, on the other hand, is almost wholly under cultivation; it is also slightly more elevated, rising in some places to nearly 200 feet. The chalk is in parts cultivated (the capping of drift being chiefly occupied by woods of beech and oak), but by far the larger portion is bare down. At the eastern boundary of the district the chalk ridge attains an elevation of over 600 feet. The portion west of the river is a part of the well-known "Hog's-back;" it is very narrow, the strata being tilted up at such a high angle, that the northern slope is as steep as the southern escarpment; its highest point is just over 500 feet. The lower greensand is, to a very large extent, occupied by pine-woods and extensive heaths. The Folkestone beds rise very steeply from beneath the chalk; in one place they attain the same elevation as the latter (500 feet), although the horizontal distance between their respective summits is only about half a mile. The Hythe beds are cultivated to a much larger extent than the last; they are also less elevated, their highest points, which are capped by an outlier of the Folkestone strata, not rising much above 300 feet. South of our area, however, they rise above the Weald with a fine rugged escarpment, which includes some of the highest points in the S.E. of England. The Wealden inlier forms a tract of swampy common only slightly elevated above the level of the river; it is also covered to a large extent by river gravel, etc., deposited by that stream and its tributaries. There is little doubt but that it is the bed of an ancient lake.

HESPERIDES—**HESPERIDÆ**—*Nisoniades tages*, L.—1896: Not so common as usual, and late, not seen before May 11th. 1897: Rather scarce, and later, May 17th. *Syrichthus malvae*, L.—1896: Rather scarce, first, May 11th. 1897: Very scarce, May 17th. *Pamphila sylvarum*, Esp.—1896: Much scarcer than usual; 1897: Fairly common. In most years it is very abundant. *P. comma*, L.—1896: Commoner than I have ever noticed it before, and out early, the first being observed on July 23rd. 1897: Not common and late, August 5th. *Thymelicus tharunus*, Hufn.—1896: Common. It had been rather scarce for several years previous. 1897: Not common.

PAPILIONIDES—**LYCENIDÆ**—*Chrysophanus phlaeas*, L.—1896: Fairly common, but in nothing like the abundance in which it occurred in 1893. 1897: Fairly common. First and second broods very late. Third brood just out in considerable numbers on Oct. 5th, most of those observed being females. The first brood is always scarce here, and the few specimens obtained of it all agree with the ab. *intermedia*, Tutt, the fore-wings being brassy or golden instead of coppery. *Polyommatus corydon*, Poda.—1896: More abundant than I have ever seen it. The disproportion between the sexes was very

great, the males being in a majority of at least thirty to one. 1897: Scarce and late. The typical greenish-blue male is scarce here; ab. *marginata*, Tutt, one or two—most of the specimens have the marginal bands of fore-wings pale, and marked with more or less distinct whitish rings; these seem to agree with the var. *hispana*, H.S.; others with bands dark and unspotted—ab. *caerulea-marginata*, Tutt—also occurred. Most of the females are typical, but a few of the ab. *aurantia*, Tutt, were met with. One very large specimen has the basal spots on underside of fore-wings absent, being thus parallel with *P. icarus* ab. *icarinus*. *P. icarus*, Rott.—1896: Very abundant. 1897: Not nearly so numerous. The males seem to be typical, the only variation being a slightly darker, more violet, blue in some specimens, and one with marginal dots on hind-wings—ab. *celina*, Oberth., taken June 17th. 1897: Some of the females agree with the ab. *iphis*, Baumh.; others have the base more or less lilac-blue, the amount of blue varies from a few scales in some specimens, to others in which it covers half the wing. Some fine examples occurred of the ab. *caerulea*, Fuchs, and also a few of the ab. *caerulea-cuneata*, Tutt. The typical lilac-blue female is scarce here, and I have not seen any for several years. Under-side males, one or two of the ab. *iphis*, Meig, occurred; also others intermediate between this and the type. Females, mostly typical, but one or two have the lower basal spot on fore-wings double. *P. astrarche*, Bgstr.—1896: Scarce. 1897: More numerous. Slight variation in depth of ground colour, some being much paler than others. The spots on the under-side vary considerably in size and number; the transverse row on fore-wings often consists of five, but usually of six spots, and, in one or two instances, there is a small seventh spot near the costa. A small female, taken on August 18th, 1897, is only $\frac{3}{4}$ in. in expanse. *Cyaniris argiolus*, L.—1896: Abundant. As a rule, this species is rather scarce. The first brood was out in large numbers about May 9th—a late date; in 1894 it was well out by April 10th. Have never met with a second brood until 1896—it was out in far greater numbers than the first by July 15th; the females of this brood were very scarce. 1897: Rather scarce. First brood, April 26th, being thus earlier than last year. Second, only a few met with on August 5th. *Callophrys rubi*, L.—1896: Scarce, not seen before May 11th. 1897: Scarce, first May 17th. This only occurs in small numbers here.

PIERIDÆ.—*Pieris brassicae*, L.—1896: No specimens of the first brood were observed, and the second only occurred in very small numbers in July and August. As far as my own observations extend, this species was totally absent during the years 1894–5, and very scarce in 1893. Its reappearance is therefore interesting, as, previous to 1893, it was one of our most abundant species, its larvæ often doing a large amount of damage. 1897: First brood very scarce. Second fairly common. *P. rapae*, L.—Very abundant. It was very late, no specimens being seen until the middle of April. 1897: Abundant—later than last year, not observed before May 1st. *P. napi*, L.—1896: Very common, it was also rather later than usual. 1897: Much less common than usual. *Euchloë cardamines*, L.—1896: Very common, but rather late. 1897: Rather scarce and late, not observed until May 1st. *Gonepteryx rhamni*, L.—1896: Very common, as a rule it is rather scarce. Out early, several fresh specimens being seen on July 15th. 1897: Hy-

bernated specimens very common in the spring, but it has been very scarce this autumn. On May 4th I was fortunate enough to observe a female depositing ova. She laid ten eggs while under observation (during a period of about 15 minutes). Most authors say the eggs are laid on the under side of the leaf, close to the midrib; but, in the present instance, the latter position was only chosen three times. Four of the eggs were deposited on the twigs themselves, close to the leaf, and quite three inches from a bud. When a bud is chosen, only a single egg is laid, as a rule, on each, but, in this instance, the remaining eggs were laid on a terminal bud, and all on the upper sides of the leaves.

NYMPHALIDÆ.—*Argynnis adippe*, L.—1896: A few worn specimens observed at the beginning of August. 1897: Not observed. *A. aglaila*, L.—1896: This species is very local here, but it occurred in fair numbers in its chosen locality. 1897: Only one (a worn female) noticed on August 14th. I was, unfortunately, unable to make any observations during July, so missed both these species. *Brenthis euphrosyne*, L.—1896: Very common, but rather late, not seen before May 11th. In 1893 it was out by April 19th. 1897: Very scarce, and late, not being out before May 25th. Only about a score seen altogether. *Vanessa io*, L.—1896: Only three hibernated specimens seen in April, and none in the autumn. 1897: Three or four noticed in August. It has been very scarce for several years. *Aglais urticae*, L.—1896: First brood abundant, well out by the first week in June. Second, rather scarce. Larvæ abundant. A large number bred from these, nearly all typical, but a few are more brightly coloured, and have the two central spots nearly absent, thus coming near the var. *ichnusa*, Bon. One taken on July 15th, is rather dark, and has the inner marginal spot joined to the central costal spot by a dark cloud, being thus intermediate between the type and the var. *polaris*, Stgr. 1897: Rather scarce. Larvæ of first brood not common, and about 50% of them infested with Dipterous parasites. Second brood not nearly so common as usual in August. Larvæ of third brood met with in considerable numbers on September 10th. They were in all stages, some nearly full-fed, the imagoes from these are now (October 14th) emerging. The small ones, on the other hand, are not all full-fed yet; a few have pupated during the last day or two. *Eugonia polychloros*, L.—1896: One on August 5th. 1897: Only three seen, one in March and two in August. It is always scarce here, although it occurs in fair numbers a mile or two south of our area. *Pyramis atalanta*, L.—1896: One on July 9th. In most years it is common enough. 1897: Scarce. About a dozen larvæ met with on September 10th; some of them full-fed, but others very small. Two imagoes emerged from the former on October 14th; some of the latter, however, have only just pupated. The larvæ were exceedingly variable, the above small number including examples of all the four varieties figured by Hofmann, *Die Raupen*, 3, 12, a. b. c. d.

SATYRIDÆ.—*Pararge megaera*, L.—1896: Very common; the first brood was rather late, not being seen before May 20th. The second was more numerous than the first, and was out in large numbers by July 15th. This species had been less common for several years, but in 1896 it quite recovered its lost ground. 1897: First brood

rather scarce. A female, taken on June 17th, has three secondary spots with white pupils on each fore-wing. They are in the position described by Mr. Tutt, *Brit. Butts.*, p. 393. Second brood very common, but little variation observed; a partial third brood occurred here in October, 1893, but nothing of the kind was observed in 1896, or in the present year, 1897. *P. egeria*, L. var. *egerides*, Stmgr.—1896: Very common, much more so than usual. It is difficult to say, with certainty, how many broods occur in a favourable year, but in 1896 four occurred here; the dates (which are, as near as possible, absolute, and refer to one locality only) being as follows: First brood, April 30th to June 2nd. Second brood, June 13th to July 6th. Third, July 18th to August 5th. (Fairly common, but much worn on latter date; possibly on the wing for some time longer, but none seen on August 20th). Fourth, September 14th. It was more numerous on the 16th, but after that the weather set in very wet and cold, and no more were observed. 1897: First brood, May 1st to June 12th. Second, June 17th to July 11th. (In fair numbers on the latter date, but all much worn). Third, August 14th to September 20th. Up to date no fourth brood has been observed. The males show considerable variation in the extent of the pale spots; some have them much reduced and more fulvous in shade, ab. *intermedia*, Tutt, while in one or two instances they are nearly obliterated altogether from the hind-wings. I have noticed that the females emerge with great regularity, about ten days later than the first males; they also remain on the wing for a much shorter period than the latter, disappearing after about twelve or fifteen days. The males, on the other hand, occur over a period of about five weeks in all the broods except the fourth. (Newman—who gives April 10th to 20th only—seemed to know less about this than some of the other species). *Hipparchia semele*, L.—1896: Occurred in fair numbers in several parts of the district—most numerous on the chalk and lower greensand, but it also occurred on a boggy moor on the Bagshot sand, where it seemed as much at home as on the dry stony hills, with which usually it is associated. The males show some variation in the extent of the pale markings, some have traces of a pale band on both fore- and hind-wings, and the orange spots on the latter large; of ab. *suffusa*, Tutt, a few, and of ab. *carca*, Tutt, two or three. Some of the females are very large, and richly coloured, several being over 2½ in. in expanse. 1897: Scarce, and much later than last year. *Epinephele janira*, L.—1896: Abundant. 1897: Not nearly so numerous. Most of those observed were typical, but a number of males of the ab. *suffusa*, Tutt, were taken. *E. titheons*, L.—1896: Very common, more so than for several years past. 1897: Much less numerous. Variation very slight. *Enodia hyperanthus*, L.—1896: Common, but less so than in some years; 1897: Rather scarce. It is always local here. The ocellated spots vary slightly in size and number, but nothing remarkable was observed. *Coenonympha pamphilus*, L.—1896: Not very common; which is rather remarkable, in most years it is, perhaps, the most abundant species found in the district. 1897: Very common. First brood late, not out until May 25th. Second, also very late, being only just emerging on August 30th. Variation slight, but one or two males of the ab. *lyllus*, Esp., occurred; the ab. *ocellata*, Tutt, also occurred in fair numbers.

The Genus *Oporabia*.

(Concluded from p. 286).

By LOUIS B. PROUT, F.E.S.

2a.—VAR. (?) (AUTUMNARIA, WEAV. =) ADDENDARIA, B.—WHITE.—Weaver (*Zoologist*, 1852, p. 3495) says that this is readily distinguished from *nebulata* and his *neglectata* (i.e., large *nebulata*) by the glossy silver and fineness of the wings, and the slenderness of the antennæ; that it varies in size and in shade, some specimens being rather darker, but not without markings; and that it rests on branches of birch. He obtained a few in Perthshire in 1851, and very sparingly in previous seasons. He indicates nothing but its larger size, and its attachment to birch, to distinguish it from *approximaria* and *filigrammaria*. As regards the feeding on birch, Mr. W. Salvage says he meets with *nebulata* (*dilutata*) only on birch, and that the larvæ most certainly feed on that tree. Mr. Logan (*Zool.*, 1858, p. 6285) bred *autumnaria* (i.e., *addendaria*) from birch, "the larvæ differing sufficiently from that of the common *dilutata*, but not," he suspected, "equally from that of *filigrammaria*, which had been reared the same season, by a Mr. Wilson, from larvæ on heath." Unfortunately, Mr. Logan does not describe the larva; nor does Mr. Gregson, who records that Greening bred a series from oak; and also that he himself bred a series of *approximaria* from birch. Evidently nothing definite can be gathered from the food-plants.

Mr. C. Fenn tells me that in June, 1875, he received, among a lot of larvæ from Rannoch, a few of an *Oporabia*, feeding on *sallow*, *Vaccinium*, etc., which Mr. Carrington considered *autumnaria*. He reared them, and the moths emerged at intervals from September 12th to the end of October; except that they were a little more silky in appearance, they seemed to him, "true *dilutata*." In case, however, they were veritable *addendaria*, I quote the larval description, which he has kindly placed in my hands. "15th June, 1875. Elongate, slightly attenuated anteriorly. Head rounded, body with a few scattered short hairs. Colour green, with a greyish tinge on the back. Dorsal and sub-dorsal lines, and a faint thread between them, grey. A whitish spiracular band, only distinct on the posterior segments, where it margins the blunt anal flap. This spiracular band is shaded below with darker green than the belly, which is paler than the ground colour. Head pale green, dotted with brown." This description is, in some respects, intermediate between normal *nebulata* and *filigrammaria*.

Dr. Buchanan White admits that *addendaria* is very closely allied to *filigrammaria*, but considers there is a slight difference in the genitalia—a difference which unfortunately is not confirmed by Mr. Pierce's investigations. Dr. White only examined two specimens of each of these species, and the difference, as shown by his figures, was very slight, and perhaps due to some accident in preparation; at any rate, Mr. Pierce's numerous examples come between Dr. White's two extremes, and apparently yield nothing of importance for differentiation. It may, however, be useful for reference if I quote Dr. White's statements: "On the ventral hind margin of the last abdominal segment of a male *Oporabia* are two short spine-like processes. In *dilutata* these are rather near each other, and form short spines longi-

tudinally striate near the tip. In *autumnaria* they are rather further apart and less distinctly spine-like, while in *jiligrammaria* they are much flatter, and little more than tooth-like projections of the hind margin." I may add that the distinction of the first-named from the other two is again evident enough.

Dr. White adds little that is new as to the differentiation by wing-shape or markings, etc. His measurements, based on 21 specimens, give the size range from 34–41mm. (say 16–19 lines), with an average working out at just 37mm. For *jiligrammaria*, his measurements, based on 15 specimens, give 28–36mm. (say 13–17 lines), the ♀s nearly always smaller than the ♂s; the average size works out at just 32mm. As regards form, etc., he considers that *addendaria* has more ample wings, especially in the female (sexes nearly equal in size), less concave outer margin, and, consequently, less produced apex. As regards markings, he mentions that *jiligrammaria* has a greater tendency to suffusion, and also has often a more distinct and darker marginal band to the hind-wings.

Gregson apparently separates the two chiefly by the different localities in which they occur, and the different seasons at which they appear (*jiligrammaria*, August—beginning of September; *addendaria*, October and November); but also appeals to the larger size of the last-named, the more elongate under-wings of the ♂ *jiligrammaria*, and the great difference in the females. Unfortunately, the dates are very unreliable for different parts of the country, Dr. Buchanan White and Sir T. Moncreiffe giving August or the 1st of September onwards for *addendaria*, and September to October for *jiligrammaria*. Buckler's notes (*Larvæ*, vii., pp. 163–5), and Mr. Clark's (*Ent. Rec.*, viii., pp. 289–90) show how the dates for the larvæ may vary. My own Bolton *jiligrammaria* this spring did not hatch till March 17th, though the Lancashire larvæ usually hatch in February, or even the end of January; and, as regards the lack of agreement between the imaginal dates and the imaginal characters, I would point out that even Mr. Gregson had to admit a difficulty. In the report of a meeting of the Northern Entomological Society (*Zool.*, 1859, p. 6354) he announces that he exhibited "a number of *Chematobia autumnaria* (!), taken by Mr. Mawson, of Cockermouth, during the last week in October. This year they are like *Oporabia jiligrammaria*, but as that species would pass away in September, at the very latest, they confirm what has been advanced at these meetings before, namely, that there is a good species allied to *O. jiligrammaria*." I trust the sound logic of this argument will commend itself. I may remind my readers, by the way, that Mr. Clark's series, bred from a single batch of eggs, which hatched within a period of five days, emerged from August 5th to November 11th.

As regards the distribution of *addendaria*, little can at present be stated definitely. If it be a valid species, I should refer my Schneeberg specimen, and the other Continental examples referred to already, to this rather than to *jiligrammaria*; this would give it a tolerably wide range. In Great Britain, I can only definitely give Delamere, and Dr. Buchanan White's Forth, Tay and Dee districts (*Scot. Nat.*, iv., p. 122). Mr. Porritt introduced *autumnaria* in his Yorkshire list as a variety of *dilatata*, but he informs me that the specimens in question proved to be merely "worn or dingy *jiligrammaria*," which he used to

take at lamps near the town (Huddersfield), and at rest on birch, etc., and which he now regards as "stragglers from their more natural habitat (the moors)."

Mr. Salvage is convinced that this is only a variety of *filigrammaria*, and Mr. McArthur also confesses that he cannot draw the line between them, though out of deference to Dr. White, he admits that they may be distinct. Actual intermediates do not seem to be very frequent, though Mr. Clark's series may perhaps be so regarded. Mr. Salvage writes me that the eggs he obtained, and from which Mr. Clark bred, were from true *filigrammaria*, taken among heather, at about 1,500ft. elevation. Is this perhaps a slip of the memory? Mr. Tutt is under the impression that he heard at the time that the eggs were from a lowland female.

2b.—VAR. (?) APPROXIMARIA, WEAVER.—This must also be regarded as an intermediate form between *filigrammaria* and *addendaria*, as Weaver himself says (*vide*, *Ent. Rec.*, vii., 291). From the whole tenour of his remarks, I feel no doubt that it was simply a large variety of *filigrammaria*, with a preponderance of dark specimens. I do not know whether he suspected that they fed on the spruce fir; if not, there is really nothing but size to differentiate them from the type. Messrs. Gregson and Salvage have both mentioned the frequent occurrence of *filigrammaria* in fir woods where heather grows. It may be of interest to remark that Herr R. Püngeler, in a recent number of the *Stett. Ent. Zeit.* (in some "Mittheilungen aus der Schweiz") records *dilutata* at considerable elevation, the larvæ on *Pinus larix* tolerably different from the normal form, but producing imagines hardly differing from the type. It is a reasonable conjecture that these would belong to the *filigrammaria* group, but no description is given to aid the determination.

I doubt whether Mr. Gregson's present *approximaria* is at all the same as Weaver's. Mr. Gregson (*Zool.*, 1858, p. 6194) says that Weaver saw his series, and Weaver cites Gregson's MSS. It is therefore reasonable to assume that both writers were dealing with the same form. But Mr. Gregson's series was bred from birch, and his present idea of *approximaria*, as shown by two specimens named by him, and kindly sent by Mr. Pierce, is of a dark narrow-winged *nebulata*. Mr. Sydney Webb has the original series of Gregson's, and inclines to call them vars. of the last-named species. I therefore express with some diffidence, what is nevertheless my own very decided opinion (based on personal inspection), that they are a darker, less glossy form of the *autumnaria* of the same locality (Delamere). The only information that Mr. Gregson has published on his *approximaria* can be summed up as follows:—1st, That it occurs in Delamere Forest, about the same time of the year as *nebulata*. 2nd, That the larva feeds on birch. 3rd, That the hind-wings are elongate, and have the band running across them, not parallel with the cilia, as in *nebulata*. This characteristic of the hind-wings, however, is also adduced to *filigrammaria*, *autumnaria* (*addendaria*), and *precursaria*. 4th, That the form of the female is even more distinct from *filigrammaria* and *addendaria* than they are the one from the other.

Mr. Pierce has obtained from Mr. Gregson a little further information. I quote what Mr. Pierce has written me on the subject: "He (Mr. Gregson) says *dilutata* feeds on oak, and is bright velvety green;

approximaria on birch, and is not so velvety. *Approximaria*, as far as I can gather, is *dilutata*, fore-wings no object, but hind-wings are very narrow, and margin runs across the wing, and not parallel with the cilia. In *dilutata* this starts, in well set specimens, not from the anal angle of the hind-wings, but above, and runs at the same distance from the cilia all the way along the wing. In *approximaria* it starts from anal angle and runs across the wing, more like *filigrammaria*." Mr. Pierce's bred specimen (unfortunately, without history) seems to me to be a stunted and narrowed form of *nebulata*, and I should have thought, from the evidence of Mr. Webb's cabinet, that Mr. Gregson, in the olden times, would have referred it to his *precur-saria*. It certainly does not belong to the *filigrammaria* group, and I have a bred ♀ from Epping Forest entirely agreeing with it. The captured specimen, named *approximaria* by Mr. Gregson, is certainly a normal *nebulata*, with which the genitalia perfectly agree, and could be matched by dozens of London specimens.

I am afraid I have trespassed most unwarrantably on your patience, and can only, in conclusion, reiterate the hope that I may have succeeded in stimulating a fresh interest in this perplexing genus.

On the habits of *Metœcus paradoxus* and *Velleius dilatatus*.

By W. H. TUCK, M.A.

Every autumn I am asked by many correspondents for specimens of the wasp-beetle (*Metœcus paradoxus*), which is very common in my district, in favourable seasons. I am of opinion that if the nests of its host, *Vespa vulgaris*, the small "anchor-faced" wasp, were more frequently examined in the proper season, the parasite would be often obtained.

With me it occurs in about a fifth of the nests I open. I have found 24, 12 and 8 in one nest, but 4 and 2 are the usual numbers, and then generally in pairs. I have taken 17 of the beetles this autumn, from seven nests, out of 24 examined—the first, August 2nd, the last, October 1st, which gives a pretty wide margin for search.

The life-history of this interesting beetle is still involved in much mystery, and although I have taken a large number at different times, I can offer no explanation upon the following points, *viz.*, why the perfect insect is seldom, if ever, found outside; how the female passes the time until she finds and enters the nest; and how the race survives when two or more wet seasons prove fatal to its host.

As far as I can ascertain, the female beetle—which probably lives underground—enters the nests from about the middle of July, and remains in them until they are sufficiently advanced to lay her eggs; and no insect is more irregular than this wasp, as I have seen plenty of nests from July to December.

The eggs are very soon hatched, and the grub grows rapidly, and having consumed a certain number of the wasp grubs, spins itself up in a cell side by side with the young wasp grubs—generally the males. The perfect insect appears to wait for some time in its cell, possibly in order that the wasps may liberate it by eating away the silken cap, and it is not difficult, by the aid of a good glass, to find the parasite, but in some cases the cap must be removed. When this is done, the

beetle often runs out and flies away at once to the window. I consider that in about eight weeks from the date of finding the nest is the best time to open it up, as, if done sooner, no good result will follow, and if delayed too long the parasites all disappear, unlike the *Cryptophagi*, and other inquilines, which remain until the nest decays.

Another of our rarest beetles, *Velleius dilatatus*, breeds in the nest of the hornet (*Vespa crabro*). The proper time to take a nest is about the middle of October, as then all the sexes can be obtained, and the full-grown larvæ of the beetle. In 1896 I took a large nest from an oak tree, and found 18 queens, 26 males, and 53 workers, and several larvæ of *Velleius*, but I failed to rear any. Some years ago I found a perfect beetle and a good many larvæ in a nest of *Vespa germanica*, in a tree stump, which the year before had been occupied by hornets. The nest should be attacked in the day time, as the hornets work all night, and the hornets killed or stupefied two hours previously. They succumb very readily to any strong mixture, and the nest should be secured before the young hornets in the cells have time to develop, or the operation is attended with some danger. The nest, unlike any of the wasps', seems to be made from the scrapings of rough bark. I took a nest, this year, in a bank—a very unusual place, as the nests are generally to be found in old trees, or thatched buildings. In one nest, in a granary, I found a colony of *Lepisma saccharina*, the "fish" insect (which is known to infest kitchens), besides a good many *Cryptophagi* and other small beetles.

Some further notes *re* the Tephrosia hybrids.

By W. S. RIDING, B.A., M.D., F.E.S.

Following up my notes on this subject (*ante*, pp. 149-150; pp. 243-246; pp. 277-278), I would add that the pupæ of the hybrids have been kept during the autumn, either in a lumber room facing N.W., with open window, or in an outside larder. The insects continued emerging more or less during a period of over four months, and till recently; the last hybrid of ♂ *T. bistortata* + ♀ *T. var. delamerensis* appearing on October 22nd, two pupæ remaining at the present time; the last of ♂ *T. var. delamerensis* + ♀ *T. bistortata* about the middle of September, no pupæ left; the last of ♂ *T. bistortata* + ♀ *T. biundularia* on October 24th, two pupæ remaining*; and the last of ♂ *T. biundularia* + ♀ *T. bistortata* on October 21st, seven pupæ left.† The weather being now cold, and east winds prevailing, it is doubtful whether these pupæ will produce more imagines this year.

Of the pairings of the hybrids which yielded ova (June 13th-26th), as mentioned in a previous note, only some of the batches from ♂ (*T. var. delamerensis* + ♀ *T. bistortata*) + ♀ (♂ *T. bistortata* + ♀ *T. var. delamerensis*), proved fertile, and these only partially so, a large proportion of ova shrivelling up. The larvæ fed during July, and the first week of August, and on August 8th, I find a note in my diary: "most of the hybrid larvæ, 2nd generation (*a*), reciprocal *T. bistortata* and *T. var. delamerensis*, gone down." On August 21st, the first

* These two pupæ emerged on Oct. 31st and Nov. 3rd, respectively.

† Two of these emerged Oct. 30th and Nov. 1st, leaving five pupæ.

imago appeared, whilst some of the larvæ were still feeding, and the insects have continued emerging occasionally till October 19th, when, there being two days of much warmer weather (nearly 60°), a ♂ and ♀ came out. These I paired, and ova were laid on October 21st and 22nd. The batch is a fairly large one, made-up, probably, of about 150. The ova are rather bright green, with slight bluish tinge. The average size is .653 mm. vertical axis, and .488 mm. transverse axis. Fifteen* pupæ of these broods, 2nd generation (α), are going over. On August 30th, I had previously paired two hybrids of the 2nd generation (α), and ova were laid on September 3rd. On August 31st, I again paired two more, which produced ova on September 4th. The ova from both these batches were yellowish-green, and the average size was .693 mm. vertical axis, and .471 mm. transverse axis. The first batch was infertile, the second hatched on September 18th-19th, and the larvæ are feeding in a warm room at the present time (October 25th), a few being in the 2nd stage, but most in the 3rd. Other hybrids were also paired, with the following results:—

DATE OF PAIRING.	♂ PARENT.	♀ PARENT.	re OVA.	DATE OF HATCHING, ETC.
June 24	♂ <i>T. biundularia</i> + ♀ <i>T. bistortata</i>	♂ <i>T. bistortata</i> + ♀ <i>T. biundularia</i>	Rather bright green, with bluish tinge. Average size— .647mm. vert. axis, .462mm. trans. axis.	Infertile
" 26	♂ <i>T. biundularia</i> + ♀ <i>T. bistortata</i>	♂ <i>T. bistortata</i> + ♀ <i>T. biundularia</i>	Colour similar to last. Average size— .650mm. vert. axis, .469mm. trans. axis.	Infertile
Aug. 9	♂ <i>T. bistortata</i> + ♀ <i>T. biundularia</i>	♂ <i>T. bistortata</i> + ♀ <i>T. biundularia</i>	nil	
" 10	♂ <i>T. bistortata</i> + ♀ <i>T. biundularia</i>	♂ <i>T. bistortata</i> + ♀ <i>T. biundularia</i>	Ova laid on 12th. 4th week of yellowish green, with partial bluish tinge, in mass, large. Average size— .726mm. vert. axis, .495mm. trans. axis.	August, some only fertile. On Oct. 22, all except 13, which were nearly full-fed, had pupated — 2nd generation (β) †
" 13	♂ <i>T. bistortata</i> + ♀ <i>T. biundularia</i>	♂ <i>T. bistortata</i> + ♀ <i>T. biundularia</i>	Ova laid on 15th. colour similar to last. Average size— .686mm. vert. axis, .475mm. trans. axis.	Some only, fertile — mixed with the larvæ of the last pairing — 2nd generation (β) †
" 20	♂ <i>T. bistortata</i> + ♀ <i>T. biundularia</i>	♂ <i>T. bistortata</i> + ♀ <i>T. biundularia</i>	Ova laid on 23rd. colour yellowish-green. Average size— .594mm. vert. axis, .444mm. trans. axis.	Infertile
Sept. 6	♂ <i>T. var. delamerensis</i> + ♀ <i>T. bistortata</i>	♂ <i>T. bistortata</i> + ♀ <i>T. var. delamerensis</i>	nil	

Oct. 25th, 1897.

* One of these emerged Nov. 4th, leaving 14 pupæ to go over.

† Ten imagines emerged by Nov. 13th.

Sketch of the Life-history of *Metœcus* (*Rhipiphorus*) *paradoxus*.

By T. A. CHAPMAN, M.D., F.E.S.

The editor of the *Entomologist's Record* having asked me for a sketch of the life-history of *Metœcus* (*Rhipiphorus*) *paradoxus*, I make the following notes, perhaps not an undesirable thing, as my original contributions to the matter, in the *Annals and Magazine of Natural History*, are not very accessible to many entomologists.

So soon as it leaves the cell in which it is matured, the beetle leaves the wasp nest; no doubt this statement may require modification in regard to detention by weather, the observations, on which it depends, being that beetles are not to be found at large in the nest, beyond what may be assumed to have escaped from the cells between the times of taking and examining the nest, usually, in fact, none, occasionally, one or two. At large, they have been taken on flowers; but their chief occupation is oviposition. The eggs appear to be laid, and the beetles die within a few weeks of their escape. They pair readily in confinement, if placed in the sun with some vegetation and flowers.

As I failed to get them to lay in captivity, under a variety of circumstances, till I provided them with some half-rotten wood, deeply in the chinks of which the eggs were laid in little groups, I have no doubt that naturally the eggs are laid in the cracks and cavities of posts and other dead timber, such wood, in fact, as the wasps frequent to get their wood-pulp for paper-making, probably near the ground to prevent desiccation.

As I failed to get any eggs to hatch, I do not know the further history, until the following summer, that is, I do not know whether the eggs remain undeveloped all winter; whether the young larvæ develop in the autumn, but remain unhatched till spring; or whether they hatch in autumn, and find suitable hibernacula for themselves. These young larvæ are about one-fiftieth of an inch in length, little active black mites, very like the similar stage in *Meloe* or *Sitaris*, but shorter and broader. They, no doubt, meet with a wasp and attach themselves to it, when it is collecting paper material, but I have never succeeded in finding a wasp so infested, and only once saw the little mite at large in the nest. It must, therefore, very quickly transfer itself from the wasp that brings it in, to the larva that is its host. This larva is usually about half-grown when the *M. paradoxus* mite makes its way into the interior of the wasp-grub. It lies bathed in the larval fluids, and lives on these rather than eats anything. Here it may be found, generally in the flanks of the 3rd or 4th abdominal segments, until the time when the wasp-grub forms its cocoon, gradually increasing in size, until it reaches a length of 3-4 mm. The larva has not yet moulted, though it has grown so much, and still preserves the black dorsal and ventral plates, head, legs and anal suckers of the small active larva. These are now, however, widely separated by the extension of the intermediate membrane, and give the larva the appearance of an ordinary maggot with series of black marks. It is by aid of these series of marks that the larva may be seen through the skin of the wasp grub.

When the wasp-larva has completed the silken cap of its cocoon, the young *M. paradoxus* larva still possesses sufficient command of

its jaws and legs to make an opening in the thoracic front (usually) of the wasp larva, and to come outside, where it may be found lying like a collar round the neck of its host. In the process of emergence it casts its skin for the first time, and the cast skin, with the hard black parts of the *Meloe*-like larva, may be found plugging the aperture of exit, which it does so effectually that nothing but the young *M. paradoxus* larva escapes thereby. For a time the *M. paradoxus* merely sucks the juices of its host through an indiscernible opening, afterwards, however, completely devouring the whole larva. During this period it moults once more, thus moulting twice altogether. It now completes its transformation rapidly, and is ready to emerge within a day or two of the wasps in the same row of cells. It is thus confined for pabulum to the one wasp-grub that it first penetrates.

A cell with *Metocercus* (*Rhipiphorus*) is usually easy to recognise; the dome of silk is that spun by the wasp grub, the *Metocercus* adding nothing, and, so far, it is identical with its neighbours; but when there is a full-grown *Metocercus* larva, or freshly-changed pupa, the cell has an ivory whiteness, contrasting with its neighbours; when the beetle (and wasps around) are nearly mature, it looks reddish, whilst those of the wasps are comparatively green. To find the young beetle larva still within its host, requires a careful search of wasp larvæ newly spun, and younger ones, down to half-grown: but the search is always successful in a nest fairly colonised by the beetle.

That some nests have no *M. paradoxus*, and others even many, is probably to be explained by the wasps of an affected nest frequenting a post for wood pulp that had been used by the beetle for oviposition; whilst the wasps of an unaffected nest do not happen to have come across such a post.

On the occurrence of *Tephrosia crepuscularia* (*biundularia*) in Ireland.

April and May being my busiest months, I have never really worked for these insects, except in 1895, when at Enniskillen. In that year I took 18, some whitish, and some brownish, and some slightly ochreous. Of these I have thirteen with me, which I have not labelled yet, one way or the other, and these thirteen are the only material I have here for reference. All the above I took at rest on trunks of fir, during May, as under:—May 1st, 2; May 3rd, 2; May 4th, 4; May 6th, 2; May 9th, 7; May 13th, 1; total, 18. I did not search for the insect after May 13th.—(Capt.) E. W. BROWN, F.E.S., Dublin.

I have taken *Tephrosia crepuscularia* (*biundularia*) at Monaghan, and once at the Wooden Bridge, in Wicklow, when working salallows.* I do not appreciate the distinctions between the two insects; so far as I have observed, neither of the imagines occurs about here.—(Prof.) HART, L.L.D., F.E.S., Woodside, Howth.

In 1895, I took *T. crepuscularia* (*biundularia*), first on May 5th, but heard of it being taken some days earlier; in 1896, I took it on May 3rd, and it was getting over on May 13th, the first week in May seems to be the time for it. It is found on the trunks of tall fir and larch trees, in a small plantation in a private demesne near here; a walk

* The exact date of capture of this specimen would be interesting. Has Mr. Kane critically examined it?—Ed.

through the plantation may give four or five specimens, so it cannot be called common. I have seen no aberrations, and have not taken it in any other locality. The ground is quite low, I should think not many feet above the sea level. I do not think there is any other brood; I have never taken the ab. *delamerensis*. Of *T. bistortata* (*crepuscularia*) I know nothing.—J. E. R. ALLEN, Portora, Enniskillen.

The difficulty relating to the Tephrosias under discussion arises from the various forms found in juxtaposition, and the extended limits of emergence of the Tephrosias in question in the British Islands, a comparatively narrow region. Now, in order to throw some light upon the subject, we should look to the Continent on one hand, and to Ireland on the other. On the Continent, it seems to me, the question has hardly been fully worked out, especially as to the time of emergence in different countries. I notice Berce gives *Tephrosia crepuscularia*, Hb., which he describes correspondingly to our *T. bistortata*, as having a double emergence, March-April, June-August. Guenée records a second species, *T. biundularia*, Esp., from the neighbourhood of Chateaudun, similar to the British. Guillemot records the former from Auvergne, as having a double emergence, and occurring in April and June. Hofmann likewise notes it as plentiful in Germany, etc., in April-May, July-August. *T. biundularia*, Esp., he sets down as a local English, very variable form, and gives a fig. of the ab. *delamerensis*. So far, therefore, we have evidence of a Continental species with double emergence, both in the warmer portions of France and Central Europe, and in the cold and ungenial climate of Auvergne, with its late spring and chilly autumn. This insect is undoubtedly found in Great Britain, and agrees both in pattern and emergences with our *T. bistortata*. Now, let us look across the Irish Sea. I can speak with some assurance, for I have met with it, often in abundance, in fourteen Irish counties, *i.e.*, Donegal, Derry, Down, Tyrone, Monaghan, Fermanagh, Sligo, Galway, Westmeath, Dublin, Wicklow, Wexford, Kerry, and Cork, and have examined collections from several other counties. All the specimens belong to the form named *T. biundularia*, Esp. The emergence is single. This is important, as in the south of Ireland the climate should produce a double emergence in any insect which exhibits such a tendency. I have, therefore, come to the conclusion that there are two species, and that the Irish one is distinct from *T. bistortata*. The only at all important variety found in Ireland comes from a locality in co. Down, where it was discovered by Mr. Watts, and approaches ab. *delamerensis*, though not so deeply clouded. As to the ancestral form of these species, one can only speculate; but as the females are generally lighter than the males, and approximate more nearly in the two species than the other sex, I should imagine that the stirps was a pale form like a light *T. biundularia*; and that the more highly coloured and deeply marked forms are later developments. I certainly agree with Mr. Porritt in naming all the Yorkshire examples I have seen, *T. biundularia*, and I hold that in the case of that species there seems to be an inherent conservatism in regard to a single brood, as shown in the south of Ireland. Undoubtedly it has a scanty April emergence in Ireland, as elsewhere, but I know of no earlier date than April 5th, although a collector worked in Sligo all through March, in a locality where it occurs; and, in Tyrone, I have

collected by light all through that month for two seasons, nightly, but without meeting it, in a locality where it abounds in May, and I may add that these parts of Ireland are parallel as to climate with the portion of Yorkshire about Sheffield and Rotherham, where I have resided, except that we have somewhat more rain.—W. F. DE V. KANE, M.A., F.E.S., Drumreask House, Monaghan.

I have a fairly long series of a *Tephrosia*, from County Cork, that I have no hesitation in referring to *T. crepuscularia* (*biundularia*).—R. ADKIN, F.E.S., Wellfield, Lingards Road, Lewisham.

The absence, up to the present, of *Tephrosia bistortata* (*crepuscularia*), in Ireland, is, indeed, remarkable. The distribution of this, and the closely allied species, *T. crepuscularia* (*biundularia*), when the whole of the Palaearctic region is considered, leads me to support Dr. Ridgway's suggestion that *T. bistortata* is the older form. I have seen specimens of this latter species from almost all parts of this area, whilst *T. crepuscularia* appears to be exceedingly local and restricted. The occurrence of the latter species in Ireland, north and midland England generally, and south of England locally, and apparent absence in Scotland and Scandinavia, is also very remarkable, and were we in possession of some reliable detail of the distribution of the two species in Europe and Asia, the results, I doubt not, would prove interesting. I trust Mr. Hewett's appeal for material from abroad has been, and will be, generously answered.—J. W. TUTT, F.E.S.

PRactical HINTS.

On keeping Pupæ through the Winter.

During last winter and spring a discussion was carried on between some of the members of the Exchange Club, on the subject of keeping pupæ through the winter. The subject appears to us to be of such general interest to those lepidopterists who rear insects, that we have summarised the remarks made by some of those who discussed the matter, and now offer them to a wider public.—Ed.

To bring pupæ through the winter successfully requires experience, for what will suit one species may be the worst possible for others. As a general rule, the best plan is to place the pupæ in a cage or box with a lino covering. The floor of the cage should be covered with stones for drainage, and, on the top of this layer, about six inches of earth should be placed. Cover this with moss. Pupæ in cocoons should be laid on the moss. Above the moss, so as to cover the cocoons, lay four inches of loosely laid fern fronds. This is sufficient, also, to keep the extreme frost from naked pupæ. Leave the cage open (except for the lino) to the weather, and, as a rule, there will be no reason to regret the result. Leaf-spinning species should have the leaves kept moist. Moisture must never accumulate. Still, different pupæ often require different treatment. Some pupæ can hardly be kept too wet, others can hardly be kept too dry—so long as dryness and warmth do not go together. A few species, of which *Phaëtra menyantidis* is a good example, must be exposed to the weather if they are to emerge at their normal time. Vermin prey upon pupæ—mice, ants, Tineid larvæ (those of *Endrosis fenestrella* and *Ecophora pseudospinetella*), and beetle larvæ are the worst, and a white fungus

will often attack them. When this pest appears in an old cage the cage should be burnt at once.—C. FENN, F.E.S., Lee.

As to keeping dug pupæ during the winter, I have found the following method most successful:—Knock the bottom out of a box some seven or eight inches deep, and replace with coarsely perforated zinc, or, better still, with wire gauze. Level the edges at the top, and cut a piece of glass to fit accurately. Place, on the zinc or gauze, inside the box, a layer of *Sphagnum* moss, pressed down till it is at least one inch thick. On this, place a thin layer of cocoa-nut fibre, and on it the pupæ, and cover them with about half an inch of the fibre. Between it and the glass lid place some sticks crosswise, from which the insects can suspend themselves when drying their wings. The box itself should be kept in position over a flat pan of water. The *Sphagnum* should be first plunged in boiling water, then dried, and very slightly damped before using.—W. S. RIDING, M.D., F.E.S., Buckerell, Devon.

I leave all my pupæ (except those of *Eupitheciae* and other small Geometrids) in the pots in which they have pupated, covering the surface with a thin layer of moss. These pots I place outside in a covered shed, open to and facing the north, covering each pot with a sheet of glass. I leave the pots in this shed from the middle of October to the end of February or early in March, then take them inside the house, and occasionally damp the moss with tepid water. *Eupitheciae*, and other small fry, I place on dry sand in tins, covering them lightly with a layer of sand, and leave them in the shed all the winter, taking them indoors in March, and still leaving them in the tins, and not watering or damping at all. The very few butterfly pupæ I have are left in the ordinary breeding-cages, and kept indoors, but not too warm.—T. MADDISON, South Bailey, Durham.

My method of keeping pupæ has been as follows:—I have a box (or, rather, several boxes) of wood, 18in. long by 12in. wide and 15in. deep, with hinged cover of glass, sloped from back to front. In the back and front a piece of wire gauze, 15in. by 5in., is fixed for ventilation. The bottom is of similar material (wire gauze). The box stands over a zinc tray of water the size of the box. In the bottom of the box I place a layer of moss, about 2in. to 3in. deep, and on this I lay the pupæ and cocoons. I keep the boxes in my study, where there is always a fire. The water under seems to give sufficient damp. I found, however, that pupæ got down through the moss to the zinc bottom, and I am now placing over the moss a thin layer of cocoa fibre, placing the pupæ on this, and over them putting a very thin layer of the fibre. Of course, I cannot say how this will answer. I tried keeping out of doors, but found it quite impossible to exclude earwigs.—E. F. C. STUDD, M.A., B.C.L., F.E.S., Oxtou, Devon.

Last winter I did not dig up my pupæ at all, but allowed the moths to emerge where the larvæ had gone down. I am inclined to think that I shall keep to this plan. So many pupæ that are dug up and interfered with, die, and I fancy that this is often because of their having been removed from their cocoons and natural site. The objection to leaving them alone is that the pupæ may be devoured, without one's knowledge, by the larvæ of Tineids, and different kinds of vermin. Last winter I had a number of flower-pots containing pupæ (perhaps 20 or 30). Only the pupæ in one of these pots suffered from the

attacks of Tineid larvæ (or some other pest). I do not bake the earth into which the larvæ go down, because I do not know how to bake such quantities as I should want, but I sift the earth and mix it with sand. I do boil the moss, however.—W. M. CHRISTY, M.A., F.E.S., Watergate, Emsworth.

I never disturb my pupæ in the trays after going down, keeping them in a large emerging cage, fixed on the north side of my house. This cage is covered on three sides with garden-netting, and has a substantial top to keep out rain. I never damp them until spring.—J. MASON, Clevedon Court Lodge, Somerset.

I have tried many ways of wintering my pupæ. Now I always turn them out of their various pots, boxes, etc., lay the subterranean ones on silver sand, and put chopped moss over them, very lightly laid on. Those in cocoons I pin about on the sides of the cage. Those that are very small I put into small boxes, and stand on the moss, or pin on the side. I keep them in a bath-room that has no fireplace, and on mild damp days I frequently stand them on the window sill to get damped.—E. A. BOWLES, M.A., F.E.S., Waltham Cross.

The question of keeping pupæ is one which interests me greatly. I have tried leaving the pupæ alone, and I have tried moving them, and the conclusion which I have come to is, that in the cases of hibernating pupæ, the latter is better. I dig them up about Christmas, and lay them on sand under boiled moss, which I damp two or three times a week, except in frosty weather. This I have found quite successful. Those insects which pupate and emerge in the warm weather I leave quite alone, and rarely find them fail. All my breeding is done in ordinary flower-pots, half filled with sand. I use no earth, except such as is necessary for keeping potted food-plants in good condition.—J. C. MOBERLY, M.A., F.E.S., Southampton.

I keep my pupæ in a large meat safe with perforated zinc sides. It is placed out of doors, and has about 2" of peat and soil at the bottom.—H. H. CORBETT, M.R.C.S., Doncaster.

HYBERNATING LARVÆ.—I always grow the food-plant for the larvæ required in large flower-pots, leaving these in the open with a piece of perforated zinc on top, which helps to exclude earwigs, and prevents the larvæ escaping—*Caradrina taraxaci (blanda)*, *C. alsines*, and *Cerigo matura* larvæ fed all the winter of 1896, in this manner. For tree-feeding larvæ, I sleeve on growing trees, and fallen leaves help to protect them from severe frost. I have reared a large brood of *Pericallia springaria* in this manner, also of *Acidalia inornata*, etc.—(Major) R. B. ROBERTSON, Cheltenham.

I find the greatest difficulty in hibernating larvæ, and have tried many schemes, but always with partial success only; the deaths being usually far above the successes, except in the case of a few things sleeved out on trees, such as *Geometra papilionaria*, *Phorodesma batularia*, etc., which have always done well, but I have never had more than a very few larvæ of each.—T. MADDISON, South Bailey, Durham.

SCIENTIFIC NOTES AND OBSERVATIONS.

PROTECTIVE RESTING HABIT OF LITHOMIA SOLIDAGINIS, WITH SOME INCIDENTAL REMARKS ON OTHER SPECIES.—About the middle of August, *Lithomia solidaginis* was very abundant near Wilsden (Yorks). My

brother and I have worked the district for the last 20 years, and never met with it until last year, when it was common, although it had occurred in the neighbouring valley, and one could hardly work a small piece of ground almost daily for years, without meeting it, if it had occurred. At rest it has a most remarkable resemblance to the excrement of grouse—the male particularly so. It folds its wings round the body, clasps a stone with its legs, and raises its body to an angle of about 30° . Its markings, colour, shape, and mode of attachment, make the imitation almost perfect.

The particular piece of ground where this species occurred consists of boggy heath, with dwarf fir, birch, oak, mountain-ash, etc., and is remarkably rich in insect and bird life. It has produced a large number of melanic forms, among others of *Larentia caesiata*, *L. multistrigaria*, *Amphidasys betularia*, *Phigalia pedaria*, etc. Among other species that occur in greater or less abundance, are *Hepialus velleda*, *Leiocampa dictaeoides*, *Pharetra menyanthidis*, *Agrotis agathina*, *Celaena haworthii*, *Orthosia suspecta*, *Noctua glareosa*, *N. dahlii*, *Hadena glauca*, *Venusia cambrica*, *Acidalia fumata*, *Scodiona belgiaria*, *Macaria liturata*, *Larentia olivata*, *L. salicata*, *Scoparia ulmella* (*conspicualis*), *S. truncicolella*, *Penthina sauciana*, *Peronea caledoniana*, *Amphisa gerningana*, *Grapholitha geminana*, *Paedisca occultana*, *Dichrorhampha herbosana*, etc.—J. A. BUTTERFIELD, B.Sc., 35, Wrotesley Road, Plumstead, S.E.

HYBERNATION OF VANESSA IO.—On December 30th, 1896, I met with *Vanessa io*, hybernating in a pile of wood. I took it indoors for the night; in the morning it was quite lively, and, when the window was opened, it flew quite vigorously. The weather was mild.—IBID.

INFLUENCE OF TEMPERATURE ON THE HATCHING OF EGGS.—In March last, I divided a batch of eggs of *Trichiura crataegi* into two parts; one batch I kept in my vest pocket in a small glass tube, and these hatched in a few days (the first on March 29th). The rest, kept at the temperature of the atmosphere, commenced to hatch on April 14th. In April last, I similarly divided a batch of ova of *Catocala sponsa* into two portions, and treated likewise, carrying one portion in a small glass tube in my vest pocket, and exposing the other to the ordinary temperature of the atmosphere. The first hatched in five days, the other about three weeks later, on May 6th. The two lots of larvæ were kept separately, and the latter fed up more rapidly, so that there was little difference in the time they pupated. Ova of *Biston hirtaria*, *Ennomos erosaria*, *Orygia antiqua*, etc., subjected in the same way to a higher and uniform temperature, hatched sooner than those exposed to the changes in the temperature of the atmosphere. Temperature is one factor in determining the time required for the development of the young larvæ, but not the only one. The ova of *Catocala nupta*, *Ennomos autumnaria*, etc., lie over the winter, while ova of *Triphaena jimbria*, deposited at the same time, produce larvæ in the autumn, although subjected to precisely the same conditions of temperature. We meet with similar periods of rest in the life of such a plant as the crocus. The young bud is formed underground in May, but the shoot will not develop till the next spring. An onion, or a potato tuber, will not develop its shoots in November, December or January, even under the most favourable conditions, but in March it will grow vigorously under apparently unfavourable conditions. Again, the sexually produced spores of some algæ and fungi do not develop for

two, three, four, or six months. As in the case of ova, this must be due to some internal change, a change either in the embryo, or a change in the nutritive material. If it be the former, I do not see how we are to find what that change is, but if it be the latter it will be chemical. It may, for instance, be due to the fact that the embryo can only use this reserve material for food after it has been acted on by a ferment analogous to ptyalin, pepsin, etc., and that it requires a longer time for this ferment to be formed in the ova of *Catocala*, *Ennomos*, etc., than in those of *Triphaena jimbria*.—IBID.

BREEDING NOTES RELATING TO *TEPHROSIA BISTORTATA* AND *T. CREPUSCULARIA*.—I am rearing three broods of *Tephrosias*. *Batch I*:—♂ and ♀, taken on larch trunks, at Leigh (Glos.), April 9th, 1897. April 10th: twenty-five ova laid, and moths paired again; April 13th, batch of ova laid; May 3rd, ova commenced to hatch; June 7th, larvæ began to go into moss; between June 29th and July 11th, 13 ♀s emerged; between August 29th and November 10th, 36 ♂s emerged (one or two per day). *Batch II*:—♂ and ♀, taken at Leigh Woods, April 27th, 1897: April 29th, ova laid; April 30th, paired again, and ova laid; May 23rd, hatched; July 2nd, gone in to earth and moss. *Batch III*, *T. crepuscularia* ab. *delamereensis*:—Ova from ♀ taken at Delamere Forest; laid May 3rd and 4th, 1897; hatched, May 3rd; July 1st, going into earth and moss.

The ova of Batches I. and II. were larger than those of Batch III. The ova of Batch III. were not only smaller, but yellower, and more shapeless than those of Batch II. The ova of Batches I. and II. were covered with "fluff." No "fluff" was received with ova of Batch III. The eggs of Batches II. and III. hatched same day, the larvæ of No. III. being distinctly smaller.—CHAS. BARTLETT, 58, Woodstock Road, Redland, Bristol. *Oct. 22nd*, 1897.

NOTE ON *PHOTHEDES CAPTIUNCULA*.—I believe this species to be a true *Miana*, from my observations on its larva. It appears to me that *Phothedes*, as a generic name, will have to be dropped. It was given, of course, without knowledge of the larva of the insect.—J. GARDNER, F.E.S., 6, Friar Terrace, Hartlepool.

HABITS OF *ZYGÆNA EXULANS*.—This species abounded in the Tosa Falls Valley, from July 9th-16th, this year. The date of emergence turns largely on the melting of the snow. This year the snow was exceptionally deep. Going up the hillside, one first passed the imagines just emerging; then cocoons, either on stones, generally many together, or on twigs of rhododendrons—the food-plant; then smaller larvæ higher up, and, in the snow itself, young larvæ not yet melted out. I dug several from the snow.—W. BATESON, M.A., F.R.S., F.E.S., Norwich House, Cambridge.

HYBERNATION OF *EUGONIA POLYCHLOROS*.—In regard to the spring appearances of *E. polychloros*, and the question of its being occasionally double-brooded on the Continent, referred to in the *Ent. Record* for October (p. 252), I should like to direct attention to a communication I made to the *Entomologist's Intelligencer*, so long ago as late in the "fifties," in regard to a brood of eggs I had from a captured female in September. A friend who was out with a picnicing party, at May Hill, ten miles from Gloucester, boxed a specimen of *E. polychloros*, and gave it to me the next day. To my surprise, I found a regular batch of pinkish-brown eggs inside the lid of the box, as well as the

living specimen. These eggs hatched in a week or two, and I fed the little hairy caterpillars on the ground shoots of elm. I found similar larvæ on the shoots of an elm in a neighbour's garden, but none of the larvæ survived the winter.—J. MERRIN, 2, Oakleigh Villas, Gloucester.

ON THE DOUBLE-BROODEDNESS OF *EUCHLOË CARDAMINES* IN SOUTHERN EUROPE.—On the subject of *Euchloë cardamines*, I notice that Mr. Tutt says that he “almost suspects that this species is partly double-brooded in the south” of Europe, some examples having been taken near Digne, in June, 1890. The fact of a double brood is affirmed positively in a note published by M. Brown, in *Le Naturaliste*, March 1st, 1880, p. 180. He records that, in the environs of Bordeaux, there are two appearances: (1) In March-April. (2) In June. He observes that there the two generations are very different: the first consisting of small and poorly-coloured examples; the second, large and more brilliantly coloured. Perhaps the individuals from near Cauterets, in July, are of the second generation, but this is uncertain, as the altitude of the town is 932 metres.—L. DUPONT, Le Hayre, France. November 18th, 1897.

ON THE SPECIFIC DISTINCTION OF *GONEPTERYX CLEOPATRA*.—I am not sufficiently familiar with *Gonepteryx cleopatra* to speak of its specific validity, but entomologists who have often observed this species believe it to be quite distinct from *G. rhanni*. Their flight is said to be not at all similar. The dates of appearance of *G. cleopatra* are April-May, and July-August, in Angoulême, according to my friend Dr. Vollantin (*Le Naturaliste*, 1880, p. 237). Angoulême is the most northern locality of this species in the west of France.—IBID.

ON THE SUMMER EMERGENCE OF *GONEPTERYX CLEOPATRA*.—It may be of interest to record that a fresh brood of *G. cleopatra* was appearing in the gorge of the Guadalaviar, about 3,000 feet high, during the last week in July. The insects were very brilliant in colour. I had taken the species before, at Montserrat, during the second week of June, rather worn. On the Riviera, I used to get them at the end of March or early April, and on into May, in quantities; but I am not sure whether the species has two broods or only one—with different dates of emergence, according to height.—(Mrs.) M. NICHOLL, The Cottage, Merthyr Mawr, Bridgend.

PROBABLE DOUBLE-BROODEDNESS OF *EUCHLOË EUPHENOIDES*.—I am inclined to believe that *E. euphenoides* is double-brooded. When I was on the Col de Fangot, close to La Seyne, on July 4th, I saw *E. euphenoides* quite fresh. This was at an elevation of 5,000 feet. I also saw it on August 1st, on the diligence route from Briançon into Italy, quite at the top. This is about the same elevation. I was also informed by the well-known Swiss entomologist, Mr. Tasker, that he had occasionally taken *E. euphenoides* in Switzerland, in August, and he stated that these were of a second brood.—IBID.

NOTES ON *RHODOPHÆA RUBROTIBIELLA*.—In the obituary notice of the late Mr. J. B. Hodgkinson, the editor makes the statement (*ante*, p. 126) that *Rhodophaea rubrotibiella* is “at best but a doubtful species,” so a few lines on the subject may be useful. *R. rubrotibiella* is, it is true, closely allied to *R. tumidella* (the only species with which it could ever be confused), but, besides minor distinctions, the former has one very obvious characteristic, which, from its nature, makes it impossible that the insect can be identical with the latter: I refer to the thick

transverse ridge of raised scales which stands on the dorsal half of the first line, and of which there is never any trace in true *R. tumidella*. So obvious is this difference, that the two species have been rightly treated as distinct by every author of note for the last half-century, and no one who is acquainted with both can possibly question the claims of either to specific rank. It is needless here to touch on the less important distinctions, both in the imagines, as well as in the larvæ. Although I have used the above names for these species, because the one name is used in the passage referred to, I would point out that in the *Ent. Mo. Mag.*, xxii., 27-28, the late M. Ragonot, in his "Revision of the British species of *Phycitulae* and *Galleridae*," dealt fully with the puzzling synonymy, and clearly showed that *F. rubrotibiella*, F.R., should be called *tumidana*, S.V., and *tumidella*, Zk., should be known as *zelleri*, Rag., both species belonging to the genus *Acrobasis*, Z.—EUSTACE R. BANKES, M.A., F.E.S., The Rectory, Corfe Castle. September, 1897.

TINEA RURICOLELLA, STN.—In the "Current Notes" (*ante*, p. 120), Mr. Tutt, referring to my remarks on *Tinea cochylidella*, Stn., in *Ent. Mo. Mag.*, Ser. 2, viii., 79-80, says that I am inclined to keep *T. ruricolella* specifically distinct from *T. cloacella*, "because" Mr. Machin bred some specimens of the former, and there were none of the latter among them. This statement, however, does not at all represent the true sequence of my ideas. My reason for considering them distinct is, as I there most clearly stated, that in the large numbers of specimens, showing extensive ranges of variation, that have been critically examined, I have always noticed certain differences which seem constant and reliable. Mr. Machin's experience in breeding *T. ruricolella* was merely mentioned by the way as affording some slight additional support to my opinion, which had been previously formed from other considerations.—*IBID.*

VARIATION.

MELANIC THERA OBELISCATA (VARIATA).—About the middle of February I found a caterpillar of *Thera variata* descending a Scotch fir in Bostall Wood. The imago emerged with the ordinary spring brood, but was nearly black, darker than any Scotch specimen that I have seen. From the observations I have made on insects occurring in the London district, there seem to be as many species subject to melanism as in northern districts.—J. A. BUTTERFIELD, B.Sc., 35, Wrotesley Road, Plumstead, S.E.

POLYOMMATUS ASTRARCHE AB. QUADRIPUNCTA, Tutt.—I captured a few specimens of this interesting aberration, at Muchalls, Kincardineshire, in July last.—A. HORNE, F.E.S., Ugie Bank, Beaconsfield Place, Aberdeen, N.B.

NEMEOPHILA PLANTAGINIS AB. HOSPITA AND AB. RUFA.—I noticed that Barrett (*British Lepidoptera*, vol. ii., Pl. 74, fig. 2c) figures a female *Nemeophila plantaginis*, with red hind-wings, as the female of the ab. *hospita* ♂. Is not this an error? Females with red hind-wings (ab. *rufa*) are not uncommon on the Kincardineshire coast, and in the immediate vicinity of Aberdeen, where, however, ab. *hospita* has never been known to occur. All the females that I have seen on the higher moors, where ab. *hospita* is found, have the hind-wings pale yellow, but not white, as in the males.—*IBID.*

MELANIC ABERRATION OF *EUPITHECIA VIRGAUREATA*.—*E. virgaureata*, in this country, has a melanic form very much like the ab. *angelicata* of *H. albipunctata*, and, I think, just as worthy of a distinct name. Mr. Richardson, of Weymouth, first showed me this form in his collection, and at the same time kindly told me where he got them. I have bred them from his locality, and also from this district, but in each case sparingly, not more than four or five per cent. I should be interested to know if the aberration has been found elsewhere.—H. W. VIVIAN, B.A., F.E.S., Glanafon, Port Talbot. [There are some interesting notes on melanic *Eupitheciae* in *Proc. of the Sth. London Soc.*, 1890, pp. 59-60; 1891, pp. 20-21 and p. 52.—Ed.].

NOTES ON THE VARIATION OF BRITISH BUTTERFLIES.—I have just obtained Mr. Tutt's very interesting new work, *British Butterflies*, and, although it is a long while since I paid any particular attention to the subject, I have jotted down the following notes:—*Chrysophanus phlaeas*.—The very striking ab. *fasciatus* should surely have been included. It occurs both in the European and American forms. There is also a v. *chinensis*, Feld. *Polyommatus corydon* ab. *minor* was named in *Entom.*, July, 1889. *P. bellargus*.—Nothing is said about the black ♂, ab. *niger*, *Entom.*, Jan., 1889. Does Mr. Tutt doubt the sex reference? *Polyommatus icarus* v. *rufina* (Oberthür) was described in 1894 (*Etudes Ent.*, xix., p. 14, pl., vi., fig. 52). I have not seen the description. *Colias hyale* ab. *pallida*.—This name was used by Robson and Gardner, in their 1885 list, for a whitish-yellow form of the female. Apparently Mr. Tutt must re-name his ab. *pallida*, though I infer that he does not consider that of Robson and Gardner to possess valid distinctive characters. *Colias edusa* ab. *suffusa*.—This name was used previously for a form of *C. edusa*. (See *Entom.*, March, 1889). *C. edusa* ab. ♀ *obsoleta*.—This is a synonym of *pseudomas*, *Entom.*, 1889, p. 26. *Pieris rapae*.—I do not know who was responsible for the extraordinary "explanation" (*Brit. Batt.*, p. 235) about this insect and *P. protodice*, but it is, of course, absurd. The two insects are so different, that Scudder now places them in different genera. *Pyrameis cardui*.—The small form is ab. *minor*, *Can. Entom.*, 1890, p. 57. To the list of food-plants of *P. cardui* add *Sphaeralcea angustifolia*, on which I found a larva at Las Cruces, New Mexico, May 26th. Also hollyhock, to which the larvæ are sometimes quite injurious at Las Cruces. I once found a single larva on a chrysanthemum, close to some hollyhocks. *Pyrameis cardui* is one of the butterflies which visit the flowers of the plum-trees during the first half of April, in the Mesilla Valley; last year it was particularly abundant, and with it numbers of *Peridroma sancta*, another British insect, as well as several *Heliothis armigera*, and a few *Anosia archippus*. The plum-flowers, besides attracting these lepidoptera, were visited by a remarkable series of bees, mostly *Andrena*, including many new species. *Coccygnapha typhon* var. *laidon*.—Another synonym of this is v. *oreadar*, Robs. and Gard. *C. pamphilus* ab. *pallida* appears to be a synonym of ab. *albescens*, Robs. and Gard., 1885.—T. D. A. COCKERELL, F.Z.S., F.E.S., Mesilla, New Mexico, U.S.A. [I am indebted to Professor Cockerell for the synonyms which have been overlooked. There are some dozens of named forms, possibly, occurring in various parts of the world, of our British species, not included in the work mentioned. The MS.

would probably have run to 1,500 pages instead of nearly 500, and I had to cut down.—J.W.T.]

ABERRATIONS OF DIURNI.—The following aberrations have been taken during the last few years in this neighbourhood:—(1) *Lycaena arion*.—A very small specimen, $1\frac{3}{4}$ inches in expanse, taken with the ordinary forms on the Cotswold Hills, a few years since, towards the middle of June, after a dry spring, which probably stunted its food-plant. (2) *Aglais urticae*.—I have a specimen remarkable in having a silvery spot on the costa of the fore-wings beneath, and occupying the centre of the third black costal blotch (the one nearest the base). It was bred from a larva fed up with a large number of others, which produced only the ordinary type. (3) *Syrichthus malvae* ab. *taras*.—A specimen with the central area of the wing marked with a distinct band of white blotches. The hind-wings with only a minute central white spot, and faint traces of subterminal band. (4) *Enodia hyperanthus* ab. *caeca*.—A specimen with only a series of white points on the underside of the hind-wings, and three ill-defined ocellated spots on the underside of the fore-wings. It, therefore, agrees with the ab. *caeca* on the hind-wings, but not on the fore-wings.—J. MERRIN, Gloucester.

ABERRATIONS OF NOCTUID MOTHS FROM NAVESTOCK, ESSEX.—I have taken the following aberrations here this season: *Xylophasia hepatica* ab. *charactera*, one only; *Agrotis exclamatoris* ab. *picea*, rather scarce, four or five only; *Noctua xanthographa* ab. *cohaesa*, very abundant, far more so than the type; *Anchocelis pistacina* ab. *serina*, scarce, six only taken; *Miselia oxyacanthae* ab. *capuina*, dark, and very abundant, quite outnumbering the type; *Cidaria russata* ab. *perfuscata*, one only.—(Rev.) W. CLAXTON, Navestock Vicarage, Romford.

ABERRATIONS OF ABRAXAS SYLVATA (ULMATA).—I have, I believe, a form of this species rather different from any captured by Mr. Dutton. It is a male of the light form, that has the fore-wings only splashed with the leaden-blue colour, the suffusion occupying the centre of the wing. I consider it a very striking form.—S. WALKER, Eddercliffe, Queen Anne's Road, York.

NOTES ON COLLECTING, Etc.

NOTE ON *PLASTENIS SUBTUSA*.—In the first week in August I took *Plastenis subtusa*, somewhat freely, near Wisbech, both at sugar and at rest, among the ivy on five large poplars. One always expects to meet with this species (and *P. retusa*) more readily in the larval stage earlier in the year. Of course, one takes it occasionally at sugar, but not freely.—J. A. BUTTERFIELD, B.Sc., 35, Wrothesley Road, Plumstead, S.E.

SIREX JUVENCUS IN BOSTALL WOODS. — Last autumn, I found a female *Sirex juvenus*, in Bostall Woods, with its ovipositor firmly fixed in a larch tree, evidently in the act of ovipositing.—IBID.

CHÆROCAMPA CELERIO IN SHROPSHIRE.—Mr. G. Potts, of Broseley, Salop, caught a very fine ♀ *C. celerio*, while it was hovering over some fuchsias in his garden, at dusk, last Monday (Oct. 18th). Mr. Potts, who most generously gives away his entomological captures, was good enough to present the insect to me, and I had the pleasure of setting

it yesterday. The specimen is in such fine condition, that it seems hard to believe that it was bred abroad. This species is double-brooded in Southern Europe, appearing in early June, and again in September; it seems to me most probable that a few insects of the first brood find their way to this country, and become the parents of the specimens which appear, now and again, in various parts of Britain. This may well be so, for the larva feeds not only on vine (*Vitis vinifera*), but also on lady's bedstraw (*Galium verum*). I have repeatedly taken the insect abroad, but this is my only English specimen.—F. B. NEWNHAM, M.A., Church Stretton. Oct. 22nd, 1897.

COLLECTING IN THE BRAMPTON DISTRICT (CUMBERLAND), 1897.—The season here has been a very bad one. The sawflies produced *Panolis pini-perda* (two only), several red forms of *Pachnobia rubricosa*, while *Taeniocampa gothica*, *stabilis*, and *puberulenta* were very common. *Taeniocampa incerta* was not so common as usual, and they were all of var. *instabilis* form. Among the Geometers during March, I only noticed *Hybernia marginaria* and *Larentia multistrigaria*. On April 6th, *Melanippe fluctuata* appeared, and sawflies produced insects until April 20th. The month of May was not very productive, as *Cidaria suffumata*, *Anticlea badiata*, *nigrofasciaria*, and *Coremia unidentaria*, were the only species obtained. During the month of June, insects were more plentiful. *Dicranura vinula*, *Lomaspilis marginata*, *Cidaria silvaceata*, *Cabera pusaria*, *cranthemaria*, *Acidalia remutata*, being frequent. Insects were attracted by sugar from June 15th to July 7th, during which time *Agrotis exclamatoris*, *segetum*, *Xylophasia monoglypha*, *Miana strigilis*, and *Noctua plecta*, were very abundant, whilst *Pharetra rumicis*, *Hadena thalassina*, *adusta*, *Apamea basilinea*, *Noctua c-nigrum*, *Mamestra brassicae*, *Leucania comma*, and *L. pallens*, were not so abundant, and of *Thyatira batis*, *Pharetra megacephala*, *Acrionicta leporina*, *Xylophasia hepatica*, *Grammesia trigrammica*, *Noctua festiva*, *Hadena contigua*, only single specimens were taken. After July 7th, insects were not nearly so plentiful at sugar, owing to the great heat. *Phibalapteryx lignata* turned up for the first time on July 1st, only three specimens were taken, however; these were flying at dusk. A number of green Geometrid larvæ were swept from bilberry, which afterwards turned out to be *Larentia didymata*. *Hypsipetes sordidata* larvæ were very common on the sawflies, only a very few were found on bilberry. On July 8th, *Enodia hyperanthus* appeared; about 10 per cent. were the ab. *obsoleta*, Tutt; another specimen had the ocellated spots on a pale band. August was not very productive. *Hepialus sybrius*, *Geometra papilionaria* (two), etc. *Pyrameis cardui* appeared on August 31st, in this locality, after an absence of some years. September was a complete blank, and only *Calocampa crocota* has been taken, at sugar, in October.—G. B. ROUTLEDGE, F.E.S., Tarn Lodge, Head's Nook, Carlisle.

NOTES FROM FARNBOROUGH.—I have seen living *Polia flavicincta*, captured at Bexley, this year. Here, my most welcome visitors have been *Mellinia gilvago*, *Tiliacea* (*Xanthia*) *aurago*, and a specimen of *Plusia moneta*, the first and last mentioned both being quite new to this district. The *M. gilvago* was captured on September 17th, sitting on a cherry tree close by, but not upon, a sugar patch.—HORE ALDERSON, F.E.S., Hilda Vale Road, Farnborough, Kent.

SPHINX CONVULVULI AT BARNSLEY, SOUTH YORKSHIRE. — On September 6th last, I had a specimen of *S. convulvuli* brought to me by

the owner of a foundry, situate in the centre of the town, who found it at rest on the wall of a workshop. Electric light is used on the premises, so no doubt that was the attraction. Unfortunately, when it reached me it had gone through the inevitable match-box treatment, and is not in the best of condition. This is the second Barnsley specimen I have.—J. HARRISON, F.E.S., 7, Gawber Road, Barnsley.

COLLECTING EUPITHECIAE.—About the middle of October, 1896, after finding there were some *Eupithecia* larvæ on golden-rod, in this district, I collected a good supply of the plant, without troubling to look for individual larvæ. The plant was put into a big breeding cage, and kept in my room; but, as I was away from November to April, the temperature was probably not high most of the winter. At the same time I collected *Angelica* and yarrow from the same place. In April, *Eupithecia albipunctata* began to emerge from the *Angelica* and *E. virgaureata* from the golden-rod, and they continued to do so through the greater part of May. Towards the end of June and during July, *E. subfulvata* emerged from the yarrow. In June, *E. expallidata* began to emerge, and has continued to do so steadily till the present time. One emerged as late as October 5th. Altogether I have bred a fair number of this species. From the *E. virgaureata* that emerged in April, I obtained ova, which fed up on hawthorn, and emerged in August; so that it looks as if this species were regularly double-brooded.—H. W. VIVIAN, B.A., F.E.S., Glanafon, Port Talbot.

NOTES FROM READING.—XYLOPHASIA SCOLOPACINA IN DORSET.—In April and May, pupæ of *Sesia sphegiformis* were exceedingly scarce, but pupæ of *S. cynipiformis* were obtained more freely from oak. An attempt, on June 8th, to get *Abraxas sylvata* and *Asthena blomeri* resulted in the capture of one of the former species. In the early part of June, *Eupithecia plumbeolata* and *Dianthoeccia carpophaga* were plentiful. On June 10th, *Lithosia mesomella* and *Acidalia subsericeata* flew freely at dusk. In the week ended the 26th, *Noctua festiva*, *N. brunnea*, *Grammesia trigrammica*, *Hadena venistae*, *Dipterygia scabriuscula*, *Aplecta tincta*, *A. nebulosa*, *Craniophora ligustri*, were amongst the visitors to sugar. Five journeys during the first seven days of July, for *Dicycla* *ov*, resulted in the capture of six imagines, one example being the ab. *renago*—a sad falling off from the total for 1896. Till the end of the month nothing of note was taken, except three *Xylophasia scolopacina*, one netted at dusk, one taken at sugar, and another beaten out. These were captured near Bridport, Dorset. *Pamphila comma* was numerous on the Berkshire Downs during the first week of August. Treacling this month was almost a failure. Four visits for *Noctua stigmatica* were rewarded by three poor specimens. On the 30th, *N. castanea* ab. *neglecta* turned up at sugar, after being an absentee for years. Sweeping heath and sugaring trees near, the same evening, did not secure *Agrotis agathina*. This is a great rarity in the district. *Tiliacea aurago*, *Mellinia gilvago*, *M. circellaris*, *Hadena protea* and *Asphalia diluta* were out on September 6th, and continued to come to sugar till the end, or nearly the end, of the month. *Epineta lutulenta* was taken on the 7th, and on subsequent dates a few more were obtained. The only *Cirrhoedia xerampelina* I got was taken on the 11th. *Orthosia macilenta* and *Miselia oxyacanthæ* were fairly numerous the latter part of the month. The wind, at the beginning of October, went to due east and north-east, frosty nights prevailed, and for the

time put an end to sugaring expeditions.—J. CLARKE, Reading. October, 1897.

HABIT OF *APATURA ILIA*.—I find that *Apatura ilia* comes to sugar, also that it flies low, and comes down in the early morning, from 8 to 10 a.m., and not towards 4 p.m., as Kane says.—E. S. HARRISON.

CAPTURE OF *DEILEPHILA GALI* NEAR HONITON.—I captured a specimen of this species during the first week of August, on either the 3rd, 4th or 5th, at dusk, hovering over a flower of the tobacco plant (*Nicotiana affinis*), in the garden of Stockland Vicarage, near Honiton, Devon.—F. S. DAWE, B.Sc., 13, Walham Grove, Fulham, S.W. Oct. 10th, 1897.

DASYPOLIA TEMPLI AT BRADFORD.—My brother sent me some fine specimens of *Dasypolia templi*, captured on October 28th, on gas lamps. The specimens were posted to me, when freshly killed, in a zinc box; they carry well in this way, and arrive in fine condition for setting.—J. A. BUTTERFIELD, B.Sc., 35, Wrotesley Road, Plumstead, S.E.

NOTE ON *DREPANUS BINARIA*.—The present season has afforded a good illustration of how some species appear at unexpected places, if specially sought for. *D. binaria* has only been occasionally taken in this district in two or three distant localities. The early days of October yielding but little "sport" in winged captures, I decided upon making a larval raid upon the oaks within easy reach. The result has been a decided surprise. In each of five widely separated localities on the south, east, and west side of Gloucester, which I worked, the larvæ of *D. binaria* tumbled into the umbrella, not, it is true, in any great numbers, but the total yield was quite satisfactory, not so much on account of the insects themselves, as their affording a demonstration of the wide distribution of the species in districts hitherto not known to supply it. It seems likely that if the search for the larvæ had been commenced earlier, say in September, the number of captures of desirable species would have been increased. We know that larva-searching is constantly yielding species that are seldom or never met with on the wing; and doubtless this work would prove much more productive if the upper branches of trees could be conveniently got at. Could not collectors who have facilities for working out this "higher branch" of our work, give us the result of their experience regarding it, and add materially to our knowledge? Are there not many "high-flyers" besides that protean beauty, *Hyppisipetes sordidata*, that love to feed as high as they fly, and might not many discoveries be made by judicious tree-climbing by ladders, etc., and the adoption of other new modes of capture?—J. MERRIN, 2, Oakleigh Villas, Gloucester.

CHORTODES MORRISI (BONDII).—This species occurs not uncommonly at Charmouth. Half my series I took there.—A. B. FARN, F.E.S., Mt. Nod, Greenhithe. [This is an important note from the point of view that the original specimens of *C. morrisii* (bondii) were captured at Charmouth, and there has recently been an attempt to show that *C. morrisii* of Charmouth is not identical with *C. bondii* from Folkestone.—ED.]

A NEW LOCALITY FOR *LYCENA ARION*.—It will interest lepidopterists to hear that, whilst on a wandering tour in Devonshire, at the end of last July, I came across this species in a new locality. The specimens were, as may be supposed from the date, very much worn, but had evidently been fairly numerous. The locality is not likely to be visited by entomologists, or even tourists, at the period of the year

during which the insect is flying, and from my knowledge of the habits of the species, I should say it is likely to remain there undetected for many years.—W. G. SHELDON, Heimath, Friend's Road, Croydon.

SALE OF INSECTS.—The sale of part of the collection of Lepidoptera formed by the late Mr. J. B. Hodgkinson took place at Stevens' Auction Rooms, on Nov. 23rd, 1897. Some of the most striking lots were the following: An aberration of *Aglais urticae*, £7 10s. *Euvanesa antiopa*, 12/-, 26/-, 21/- each. *Chrysophanus dispar*, 35/-, 55/-, 16/-, 47/6, 20/-, 47/6, 37/6 each. *Polyommatus icarus*, gynandrous, 20/-. White ab. of *Zygaena lonicerae*, 22/-. One pink and five yellow abs. of *Z. filipendulae*, 44/-. *Sesia allantiformis*, 9/-, 6/-, 21/- each. *Drilephila livornica*, and three *D. galii*, 16/-, 16/-, 12/-, 14/-, 18/- per lot. *Choerocampa celerio*, 20/-, 20/-, 21/-, 10/-, 22/-, and 22/- each (one of the two last vouched for by Esson, of Aberdeen). *D. euphorbiae*, 21/-. *Nola centonatis*, 27/6, 32/6 for eleven. *Deiopeia pulchella*, 22/-, 22/-, 8/-, 18/-, 12/- each. *Eulepia grammica*, the historical Wharfedale specimen, 8/- only. *Cerura bicuspis*, 11/-, 18/- for four. *Arctia caia*, £3 15s. for five aberrations. *Laelia caenosa*, 12/-, 14/-, 16/-, 17/-, 10/-, 32/-, 14/- per pair. *Notodonta bicolor* ♂, 85/-, ♀ and pupa case, 105/-. *Gastropacha ilicifolia*, ♂ 18/-, ♀ 45/-, ♂ 14/-, ♀ 18/-. *Drepana harpagula*, 16/- (two), 50/- (three), 30/- (three), 21/- (three). *Synia musculosa*, 7/-, 11/-. *Leucania albipuncta*, five for 6/-, four for 6/-. There was a lot consisting of two specimens of *Leucania vitellina*, one caught by Capt. (Mr.) A. H. Jones, at Torquay. These two specimens went for only 7/-. *Nonagria sparganii*, 9/-, 26/-, 11/- per pair. *Luperina dumerilii* (1) and *L. guenéei* (1), 20/. *Hydrilla palustris*, 22/- for 3. *Agrotis subrosea*, 50/- (2), 42/- (2), 35/- (2), 20/- (3). *Luperina luteago* ab. *barrettii*, 55/- (for four). *Xylina conformis*, 18/- (3), 21/- (3), *X. zinchenii*, 11/- and 8/- each. *Cucullia gnaphalii*, 21/-, 21/- per pair. *Heliothis scutosa*, 55/- (the "Heysham" specimen). *Catephia alchymista*, 27/6. *Plusia moneta*, bred specimens, 2/6 each. *Cleora viduaria*, 32/6, 24/-, 14/-, 14/- per pair. *Acidalia herbariata*, 22/-, 6/-. *A. circellata*, 28/-, 30/- for four. *A. perochraria*, 6/-. *Boletobia fuliginaria*, 6/-, 12/-, 8/- per pair; 18/- for four. *Abraxas grossulariata*, one light ab., 22/-. *Phibalapteryx polygrammata*, 16/-, 21/-, 21/-, 21/-, four in each lot. *Cidaria reticulata*, 12/-, 14/-, 16/-, 35/-, 37/-, 42/- for threes. *Eumychia octomaculata*, one rayed ab., 30/-. *Diasemia ramburialis*, 26/-. *Crambus verellus*, 32/6. *Gelechia obscurella*, 20/- (two). *G. obscurella* (1), and *G. littorella* (1), 20/-. *Oecophora formosella*, 10/- (3), 8/- (3). Total for the two days' sale, £340 18s. 6d.—J. W. TURR, F.E.S.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

PUPA OF NEMEOBIUS LUCINA.—*Shape*: approaching that of the *Theclidi*. *Colour*: its colour is of a delicate pale wainscot-brown. *Hairs*: the whole dorsal surface is covered with brown hairs, about $\frac{3}{32}$ nd. of an inch in length. *Markings*: all the markings are black, and are arranged as follows:—(1) The head is marked by an unbroken line running round it to the junction of the 1st thoracic segment on either side, and reaching below the level of

the costal margins of the wing-cases. (2) The 1st thoracic segment is marked with two slightly curved lines, parallel with each other, extending to the level of the lateral series. (3) The anal segment is unmarked. (4) On the 2nd and 3rd thoracic, and first 9 abdominal segments, there is a double dorsal series of dots. (5) The lateral series are placed as follows :—(a) The 3rd to 9th abdominal segments have on either side three dots in line. The central very minute. (b) The other two of the same size as the dorsal. The 5th to 8th have a fourth minute dot, below the lower of these. (c) The 2nd and 3rd thoracic segments have the three dots, but the central is out of line, forming a triangle. In the 2nd the central dot points towards the first thoracic, and in the 3rd in the direction of the 1st abdominal segment. (d) The 1st abdominal has but two dots, the 2nd but one. (e) The costal margins of the wing-cases are marked by a line along their entire length. *Position and suspension*: Attached to the underside of a leaf of the food-plant by the cremaster, and by a silken thread passing over the body at the junction of the 3rd thoracic and the 1st abdominal segments.—H. L. Wood, Old Grammar School House, Ashford, Kent.

CURRENT NOTES.

Whilst we are doing our level best to protect *Porthesia (Euproctis) chrysorrhoea* from extermination in this country, our friends in Massachusetts, where the species was first noticed about five years ago, have passed an Act requiring local authorities to take immediate steps for its extinction, and to prevent its spread. France, as early as 1734, passed a law requiring landowners to destroy the caterpillars of this species, to which, *Porthetria dispar* and other species were afterwards added. As a matter of fact, in spite of the general abundance of these species in Europe, their numbers, except in occasional seasons, are never sufficient to cause really serious harm, and serve largely, when they are specially abundant, for exciting newspaper paragraphs. The *Bulletin* can be obtained from Professor Fernald, of the Mass. Agricultural College, Amherst, Mass., U.S.A.

Mr. T. P. Newman feels that the remark on p. 257 tends to throw a slight on the memory of his father. We need hardly assure our readers that no such slight was intended. The remark was based on hearsay evidence, and the recollection of letters received in the early "seventies." Mr. Newman thinks that our recollection may have been at fault, and states that, in his opinion, his father did not receive or distribute the eggs. This view is strongly supported by the statements in *Entom.*, vi., p. 33, and ix., p. 210.

We have great pleasure in informing our readers that Mr. Horace St. John K. Donisthorpe, F.Z.S., F.E.S., will, commencing with Volume X., edit a special section of the *Entomologist's Record*, devoted to Coleoptera. Coleopterists may, therefore, if they prefer, send their communications direct to Mr. Donisthorpe, at 73, West Cromwell Road, Kensington, W.

ERRATA.—P. 261, line 28, for "variety" read "species"; p. 240, line 47, for "*Catoptria aemulana*" read "*C. tripoliana*"; and line 49, for "*C. decolorana*" read "*C. aemulana*"; p. 281, line 2 from bottom, *E. epistygne*. This was a *lapsus calami* in the original note from which the quotation was taken for "*E. stygne*"; p. 69, line 25, for "*Catocala pacta*" read "*Catocala parta*"; p. 292, line 9, for "*Acidalia ochrata*" read *A. "perochraria."*

CONTENTS OF VOLUME IX.

	PAGE.
COLLECTING, NOTES ON 17, 39, 61, 90, 121, 153, 181, 209, 238, 265, 295, 332	
CURRENT NOTES 43, 68, 95, 119, 155, 184, 337	
FIELD WORK for February, 42; March and April, 67; April and May, 95; May and early June, 120; June and July, 152; July and August, 180; August and September, 208; September and October, 240; October and November, 264; November and December 294	
LIFE HISTORIES, LARVÆ, ETC. 37, 58, 89, 116, 146, 176, 205, 235, 261, 290, 336	
PRACTICAL HINTS 42, 67, 95, 120, 130, 152, 180, 208, 240, 264, 294, 324	
SCIENTIFIC NOTES AND OBSERVATIONS 35, 58, 89, 116, 151, 178, 205, 233, 259, 288, 326	
SOCIETIES 24, 45, 68, 97, 127, 156, 185, 212	
VARIATION 38, 61, 117, 150, 181, 207, 260, 294, 330	
VARIATIONS AND ABERRATIONS (For these see SPECIAL INDEX)	
Abdominal chambers in <i>Chrysidia</i>	
<i>madagascariensis</i> 157	
Aberrations of <i>Abraaxa sylvata</i> (<i>ul-</i> <i>mata</i>) in Yorkshire, melanica and intermediate 269, 304, 305, 332	
Aberrations of Diurni, 332; Noctuid moths 46, 332	
Aberrations of various species cap- tured in Yorkshire 46	
<i>Abraaxa grossulariata</i> emerging in November 41	
<i>Abraaxa grossulariata</i> in the winter 61	
Abundance of <i>Arctia caia</i> larvæ in Scotland 18	
<i>Acherontia atropos</i> and its aberr- ations 46	
<i>Acherontia atropos</i> at Bury St. Ed- munds, 23; Doncaster, 23; Emsworth, 23; King's Lynn, 23; Waltham Cross, 23; York, 23; in Central France, 267; in the Guildford district 123	
<i>Acherontia atropos</i> , autumnal emer- gences of, 61; breeding of, 266; in 1896, 23, 42, 64, 154; Notes on 265	
<i>Acidalia ochrata</i> from Deal and Dauphiné compared 173	
<i>Acidalia rusticata</i> , Notes on ... 94	
Additions to the British list:— <i>An-</i> <i>isolabis annulipes</i> , Lucas, 155; <i>Aspidiotus cydoniæ</i> , 119; <i>A.</i> <i>hederæ</i> , 44; <i>Aleochara succi-</i> <i>cola</i> , 155; <i>Coccus tomentosus</i> , 119; <i>Diaspis calyptroides</i> , 119; <i>Lema septentrionis</i> , 185; <i>Lita</i> <i>intermediella</i> , Hodg., 36, 71; <i>Mi-</i> <i>cropalpus pudicus</i> , 47; <i>Platyp-</i> <i>tilia tesseradactyla</i> , 45; <i>Platys-</i> <i>tethus alutaceus</i> , 155; <i>Tryphlo-</i> <i>sylla dasynemus</i> , 159; <i>T. pen-</i> <i>tacanthus</i> 55	
Affinities of <i>Epinephele titonus</i> , On the 36	
<i>Aglais urticae</i> , Living specimen of 128	
<i>Agrotis cinerea</i> at Reading... .. 154	
<i>Agrotis obelisca</i> at Bournemouth, Local form of 39	
<i>Amphidasys betularia</i> ab. <i>double-</i> <i>dayaria</i> 181	
<i>Amphidasys strataria</i> , Heredity notes on... .. 99	
<i>Anisolabis annulipes</i> from Kew Gar- dens 155	
<i>Apamea ophiogramma</i> , Breeding of, 9; Practical Hints on 130	
<i>Aphonia sociella</i> in bees' and wasps' nests 288; in the nest of <i>Vespa</i> <i>sylvestris</i> 259	
<i>Aphytoceros vagans</i> , Home of ... 151	
<i>Aplecta adreui</i> near Bath... .. 21	
<i>Aplecta oculata</i> bred in winter ... 72	
<i>Aplecta prasina</i> from ovum to imago in seven months 58	
<i>Aporia crataegi</i> in Kent 122	
<i>Arctia caia</i> ab. <i>flavescens</i> from Hackney Marsh 157	
<i>Argynnis aglaia</i> , Hybernating stage of 116	
<i>Asemum striatum</i> as a British in- sect 276	
<i>Asteroscopus sphinx</i> numerous in co. Galway 63	
<i>Asynomus aedilis</i> at Lea Bridge ... 157	
Attractiveness of dogwood sap to moths 64	
Attractiveness of light, Discussion on 178, 235	
Autumn pairing of <i>Eugonia poly-</i> <i>chloros</i> 252	
Beetles of a mud-flat, 10; that des- troy forests 32, 114	
<i>Biston hirtaria</i> in March 157	
Blood of Lepidopterous pupa ... 161	
<i>Boarmia consortaria</i> in the New Forest 213	
Books, Entomological, of 1896 ... 4	

Breeding <i>Acherontia atropos</i> , 267 ; <i>Agrotis agathina</i> , 96 ; <i>Peridroma</i> <i>saucia</i> 129	129
<i>Brephos parthenias</i> in Epping Forest 129	129
British and Foreign specimens ... 40	40
Broods of <i>Pararge egeria</i> 252	252
<i>Bruchus lentis</i> from Egyptian lentils 129	129
<i>Bryophila perla</i> , Living larvæ of ... 72	72
Butterflies of Bourg d'Oisans, The 79	79
<i>Callimorpha dominula</i> , Note on ... 153	153
Captures at Brockenhurst and Loughton in 1896 48	48
Captures in Epping Forest, Recent 129	129
Captures in Orkney in 1896 93	93
Captures at Reading in 1896 40	40
<i>Cataplectica farreni</i> in (?) North Lancashire 65	65
Catocalids, European and American 69	69
Caudal horn of <i>Agidistis</i> , On the ... 292	292
Characters of Lepidopterous larvæ, On the structural 196	196
<i>Charaxes jasius</i> , Notes on 217	217
<i>Chariclea umbra</i> (<i>Heliothis mar-</i> <i>ginata</i>) abundant in 1896 63	63
Cheshunt in June 239	239
<i>Choerocampa celerio</i> in Shropshire 322	322
<i>Choerocampa verii</i> in Aberdeenshire 63 ; in 1890 41	41
<i>Chortodes morrisii</i> at Charmouth ... 335	335
<i>Cidaria immanata</i> from Raindene Wood 156	156
<i>Cidaria psittacata</i> in the New Forest 157	157
<i>Cirrhoedia xerampelina</i> at Watford	
Classification of Butterflies, 241 ; of Lepidoptera by their larvæ, 186 ; Lepidoptera, On the ... 194	194
<i>Cleora lichenaria</i> two years in pupa 260	260
Cochliopodid Moths, Habits of the, 58 ; Larvæ of the... .. 59	59
Cocoons of <i>Acherontia atropos</i> , 35 ; <i>Graniophora ligustri</i> , 148 ; <i>Gnophria rubricollis</i> , 148 ; <i>Sa-</i> <i>turnia pyri</i> , 144 ; <i>Sphinx ligustri</i> <i>Coenonympha tiphon</i> var. <i>inornata</i> 99	99
Coleoptera at Wallasey and Llan- gollen, 49 ; Exotic, 185 ; in the winter, 307 ; near London in June, 232 ; Notes on, 10, 32, 114 ; of a London granary, 77 ; Tyrolean and Portuguese ... 71	71
<i>Colias edusa</i> and <i>Pyrameis cardui</i> 268	268
<i>Colias edusa</i> winters, How 36	36
Collecting in Cumberland, 333 ; in Switzerland, 297 ; in 1896 at 90	90
Collecting Notes, Early 94, 124	94, 124
Collection of Spring Rhopalocera, On a 279	279
Colours of insects, 159 ; of Lepi- doptera from high altitudes ... 16	16
Comparison of egg of <i>T. bistortata</i> with that of <i>T. crepuscularia</i> (illus. by plate), 216 ; <i>S. pyri</i> with <i>S. paronia</i> 145	145

Conversazione held at London Institution 156	156
<i>Cossus ligniperda</i> , Pupation of ... 266	266
<i>Crabius alpinellus</i> , The habit of ... 296	296
Critical resumé re <i>Tephrosia bis-</i> <i>tortata</i> (<i>crepuscularia</i>) and <i>T. cre-</i> <i>puscularia</i> (<i>bimdularia</i>) 6, 28, 55	6, 28, 55
Crossing of <i>Tephrosia bistortata</i> and <i>T. crepuscularia</i> 150	150
<i>Dasyampa rubiginea</i> at Reading, 154, 183 ; at Slough 93	93
<i>Dasychira pudibunda</i> emerging in November 48	48
<i>Dasyptilia templi</i> at Swansea ... 181	181
<i>Deilephila euphorbiae</i> larvæ, Lazy 228	228
<i>Deilephila galii</i> in Carnarvonshire 267	267
Description of Plate III. 135	135
Development of <i>Laslocampa quercus</i> 287	287
Development of the wing and wing- scales of Butterflies and Moths, 8, 131, 159	8, 131, 159
<i>Dianthoeccia capsophila</i> in Dauphiné 140	140
<i>Dianthoeccia conspersa</i> ab. <i>ochrea</i> from the Orkney Islands ... 72	72
Dimorphism in African Butterflies, 71 ; of <i>Melanitis leda</i> , 35 ; of <i>Polyommatus</i> 79	79
Distribution of <i>Lampides boeticus</i> ... 250	250
Double-brooded Geometrids, 173 ; Lepidoptera in 1896 137	137
Double-broodedness of <i>Euchloë car-</i> <i>damines</i> in Southern Europe ... 329	329
Double-broodedness of <i>Euchloë eu-</i> <i>phenoides</i> , Probable 329	329
Double-broodedness of <i>Euranessa</i> <i>antiopa</i> , 252 ; of <i>Plusia festucae</i> 40	40
Double broods of Lepidoptera, 22 ; of <i>Orygia gonostigma</i> 100	100
Doubtful species, Notes on : <i>Bombus</i> <i>pratensis</i> , <i>B. jonellus</i> , <i>B. lapponi-</i> <i>cus</i> , <i>B. alticola</i> and <i>B. pyrenaicus</i> probably one species, 44 ; <i>Bombus</i> <i>smithianus</i> and <i>B. cognatus</i> forms of one species 44 ; <i>Notys alpinalis</i> = <i>B. uliginosus</i> (treated as dis- tinct by Staudinger), 15 ; <i>Pem-</i> <i>phila</i> from Le Lautaret = ? <i>P.</i> <i>ornatella</i> , 15 ; <i>Procris heyerrei-</i> <i>chii</i> distinct from <i>P. statice</i> , 13 ; <i>Tinea cochyliedella</i> referred to <i>T.</i> <i>rufolella</i> , 120 ; <i>Tortrix</i> from Le Lautaret = ? <i>riburniana</i> , 14 ; <i>Zygnaea hippocrepidis</i> , Steph., 103 ; <i>Zygnaea trifolii-major</i> ... 88	88
<i>Drepana binaria</i> , Note on collecting 335	335
Drinking habits of Butterflies 52, 79	52, 79
Dwarf <i>Hybernia defoliaria</i> from Dulwich 48	48
Early appearance of Lepidoptera, 154 ; of <i>Melanippe fluctuata</i> ... 186	186
Early stages of <i>Epinephle ianira</i> , Notes on the 37	37
East coast of Scotland, Collecting on 18	18

Egg of <i>Abraaxas grossulariata</i> , 236 ; <i>Acidalia dilutaria</i> (holosericeata), 237 ; <i>A. humiliata</i> , 237 ; <i>A. per- ochraria</i> (ochraria by error), 292 ; <i>Acontia luctuosa</i> , 291 ; <i>Aleucis pictaria</i> , 176 ; <i>Calligenia miniata</i> , 263 ; <i>Catocala frazzini</i> , 147 ; <i>C. nupta</i> , 146 ; <i>Cerura furcata</i> , 177 ; <i>Choerocampa elpenor</i> , 237 ; <i>Cirrhoedia merampelina</i> , 60 ; <i>Crambus tristellus</i> , 237 ; <i>Dasy- campa rubiginea</i> , 147 ; <i>Dian- thoecia luteago</i> var. <i>barrettii</i> , 146 ; <i>Dicycla oo</i> , 89 ; <i>Ennomis autum- naria</i> , 117 ; <i>Enodia dryas</i> , 263 ; <i>Erebia aethiops</i> , 262 ; <i>Erebia neoridas</i> , 261 ; <i>Euclidia glyphica</i> , 291 ; <i>Eurrantia plumistraria</i> , 177 ; 213 ; <i>Fidonia conspicua</i> , 176 ; <i>Gnophos furcata</i> , 38 ; <i>Gonopteryx cleopatra</i> , 205 ; <i>Gonopteryx rham- ni</i> , 206 ; <i>Grammesia trigrammica</i> , 238 ; <i>Hemerophila abruptaria</i> , 177, 213 ; <i>Hydriomena furcata</i> , 110 ; <i>Leucophasia duponcheli</i> , 206 ; <i>L. sinapis</i> , 206 ; <i>Limenitis sibylla</i> , 263 ; <i>Leucania littoralis</i> 264 ; <i>Neuronia popularis</i> , 146 ; <i>Numeria pulveraria</i> , 176 ; <i>Pararge aethine</i> , 236 ; <i>Phytometra viridaria</i> , 291 ; <i>Polia xanthomista</i> var. <i>nigro- cincta</i> , 59 ; <i>Polygonia egea</i> , 147 ; <i>Polygonomatus corydon</i> , 262 ; <i>Por- thesia dispar</i> , 90 ; <i>Pygaera im- cephala</i> , 235 ; <i>Stilbia anomala</i> , 146 ; <i>Thecla w-album</i> , 292 ; <i>Tilia- cea</i> (<i>Xanthia</i>) <i>aurago</i> , 60 ; <i>T. bistortata</i> , 127, 150, 215, 243, 277, 278 ; <i>T. crepuscularia</i> (<i>bien- dularia</i>), 127, 150, 216, 243, 277 ; <i>Tephrosia</i> (hybrids), 278, 320, <i>Tryphaena fimbriata</i> , 290 ; <i>Zephyrus quercus</i> , 117 ; <i>Zeuzera pyrina</i> , 236 ; <i>Tephrosia bistortata</i> , On the protective covering of ... 118 Empty eggshell and newly-hatched larvæ of <i>Argynnis aglata</i> ... 116 <i>Emydia candida</i> co-specific with <i>E. cribrum</i> ? Is ... 140 <i>Endromis versicolor</i> bred ... 154 <i>Erebia glacialis</i> under the Matter- wald Glacier ... 290 Errata ... 24, 130, 186, 270, 337 <i>Eupithecia</i> , Collecting ... 334 <i>Euvassessa antiopa</i> in Aberdeen- shire, 20 ; at Yarmouth ... 64 Experiments on pupal blood ... 161 Explanation of Plate I. ... 5	Field observations... ... 129 Five-spotted <i>Zygaenidae</i> . Have we three British species? ... 87 Flens, New British (<i>Tryphlopsylla dasychnemus</i> , Roths., and <i>T. penta- canthus</i> , Roths.) ... 55, 159 Flower pots as breeding cages ... 153 Fluctuation of sedentary species of Lepidoptera ... 273 Food of <i>Tiresias serra</i> , Paper as the ... 162 Food-plant of <i>Lasiocampa callunae</i> , 89 ; of <i>Pyrameis cardui</i> , 331 ; of <i>Tephrosia bistortata</i> , 171 ; of <i>Tiliacea aurago</i> , 154 ; of <i>Zeuz- era aesculi</i> ... 20 <i>Gelechia samadensis</i> in the Alps ... 15 <i>Gelechia suppelietella</i> , Distribution of ... 155 <i>Gelechiad</i> new to science, Descrip- tion of ... 140 General records referring to either <i>Z. hippocrepidis</i> or to an aberration of <i>Z. filipendulae</i> ... 103 General remarks of the genus <i>Zy- gaena</i> ... 87 Geographical distribution of <i>Hy- driomena furcata</i> , 84, 110 ; of <i>Thaumatotrix cinereus</i> ... 41 Geometrid family <i>Amphidasylidae</i> , The... ... 289 <i>Grammesia trigrammica</i> ab. <i>obscura</i> ... 261 Habits of <i>Apamea ophiogramma</i> , 9 ; of <i>Apatura ilia</i> , 335 ; of <i>Gelechia pulstrella</i> , 181 ; of <i>Lampides boetica</i> , 250 ; of <i>Metoeus para- doxus</i> , 318, 321 ; of <i>Podisus luridus</i> , 64 ; of <i>Sericoris double- dayana</i> , 181 ; of <i>Velleins dila- tatus</i> , 318, 321 ; of <i>Zygaena exulans</i> ... 328 Hints as to breeding <i>Petasia nube- culosa</i> ... 182 History of <i>Zygaena hippocrepidis</i> , St., as a British species ... 103 Home of <i>Apamea ophiogramma</i> , Winter ... 100 Homoeochromatic groups of butter- flies ... 156 Hibernating Larvæ ... 326 Hibernating larvæ of <i>Coenonympha pamphilus</i> , 207 ; of <i>Hipparchia semele</i> ... 207 Hibernating stage of certain butter- flies ... 249, 279 Hibernation of <i>Eugonia polytechloros</i> ... 328 Hibernation of <i>Vanessa io</i> ... 205, 327 <i>Hybernia defoliaria</i> , Aberrations of 128 Hybrid <i>Smerinthus populi-ocellatus</i> , Notes on, 299 ; <i>Zygaenidae</i> 69, 87 Hybridisation of <i>T. bistortata</i> and <i>T. crepuscularia</i> 149, 243, 277, 319 Hybrids, Further notes on the <i>Tephrosia</i> ... 319 <i>Hydrilla palustris</i> at Wicken ... 214
---	--

Imago of <i>Hydriomena furcata</i> ...	111
Inbred <i>Eupithecia consignata</i> ...	46
Incidental note on frozen insects ...	290
Influence of temperature on the hatching of eggs ...	327
Insects at Hampstead, 20; from Cheshire (Bidston), 70; the Island of Ceylon ...	48
Interbreeding of <i>T. histortata</i> and <i>T. biundularia</i> , 149, 243, 277, ...	319
Introduction of <i>Callimorpha hera</i> into Britain, 257; Correction as to ...	337
Irish Lepidoptera ...	46
Ivy in Devonshire ...	19
Japanese Tephrosias ...	47
Jumping cocoons ...	24
Keeping pupæ through the winter ...	324
Killing insects ...	121

Larva of *Agrotis candelarum*, 96; *Agrotis subrosea*, 120; *Anacamptis corticella*, 121; *Anarta myrtilli*, 208; *Anchocelis pistacina*, 185; *Antispila treitschkiella*, 241; *Apamea ophiogramma*, 68; *Argyroresthia aurulentella*, 96; *Argyroptera maritima*, 241; *Bombyx (Lasiocampa) quercus*, 68; *B. spartii*, 68; *Brephos notha*, 68; *B. parthenias*, 68; *Bucculatrix cristatella*, 120; *Butalis senescens*, 120; *Caradrina morpheus*, 241; *Carpocapsa grossana*, 240; *Carpocapsa juliana*, 240; *Catoptria aemulana*, 240; *Catoptria tripoliana*, 240; *Charaxes jasius*, 185; *Choerocampa elenor*, 237; *Coccyx hyrcaniana*, 67; *Coccyx strobilella*, 264; *Coleophora chalcogrammella*, 120; *Coleophora fuscocuprella*, 241; *C. juncicolella*, 67; *Coleophora laricella*, 67; *Coleophora pyrrhulipemella*, 67; *Coleophora virgaureaella*, 264; *Cosmia paleacea*, 95; *Crambus tristellus*, 237; *Cucullia guaphalii*, 180; *Demas coryli*, 240; *Depressaria assimilella*, 67; *Diachlorhampa plumbana*, 67; *D. plumbagana*, 67; *Earias chlorana*, 208; *Ebnulea stachydalis*, 208; *Emmelesia decolorata*, 208; *Epichnopteryx reticella*, 183; *Eupithecia arcuata*, 265; *Eupithecia debiliata*, 207; *Eupithecia denotata*, 209; *Eupithecia nanata*, 208; *Eupithecia pulchellata*, 121; *Eupithecia sobrinata*, 121; *Eupithecia togata*, 208; *Gelechia acuminatella*, 241; *Gelechia morosa*, 152; *Gelechia naeviferella*, 208; *Gelechia notatella*, 209; *Gelechia scriptella*, 209, 241; *Harpiteryx scabrella*, 120; *Hydriomena fur-*

cata, 111; *Hydroecia petasitis*, 180; *Lampronia praelatella*, 67; *Lampronia rubiella*, 67; *Larerna miscella*, 96; *Larerna raschkiella*, 96; *Leioptilus tephradactylus*, 120; *Leucania albipuncta*, 163; *Leucania straminea*, 120; *Lithostia rubricollis*, 264; *Nematois schiffermilleriella*, 96; *Nepticula poterii*, 120; *Noctua rhomboidea*, 264; *Nonagria geminipuncta*, 152; *Orgyia gonostigma*, 100; *Pachnobia hyperborea*, 152; *Paedisca oppressana*, 67; *Pempelia formosa*, 181; *Penthina postremana*, 241; *Peronea hastiana*, 208; *Phorodesma smaragdaria*, 240; *Phoxopteryx detersana*, 240; *Platypteryx falcataria*, 240; *Platypteryx harpagula*, 240; *Polygonia egea*, 178; *Porthesia chrysorrhoea*, 152; *Retinia turionana*, 67; *Rhodophaea adenella*, 96; *Saturnia pyri*, 112; *Scaphila sinuana*, 96; *Semasia rufillana*, 241; *Sericoris euphorbiana*, 241; *Sesia philanthiformis*, 152; *Spilodes pilealis*, 241; *Stigmonota leptastriana*, 67; *Taeniocampa populeti*, 95; *T. histortata*, 243, 277; *T. biundularia*, 243, 277; *Tethea subfusa*, 95, 121; *Thecla pruni*, 73, 74; *Thera firmata*, 240; *Tiresias serra*, 162; *Trochilium crabroniforme* ... 48

Larva of *Apleta occulta*, 47; of *Cochliopodid* moths, 59; of *Deilephila euphorbiae*, 293; of *Hepialus lupulinus*, 72; of *Lasiocampa rubi*, 149; of *Orgyia*, 69; of *Saturnia carpini* ... 213

Larvæ in the New Forest ... 20

Lasiocampa quercus taking only one year to complete its metamorphoses ... 62

Lepidoptera at Church Stretton, 65; at Isle of Dogs, 156; at Sandown, 296; from Bourg d'Aru, 52; from Digne, 185; from Romanche Valley ... 83

Lepidoptera, European and American ... 99

Lepidopterous larvæ, Characters of *Leucania albipuncta*, Attempt to breed ... 162

Leucania extranea in Carnarvonshire ... 267

Life-history of *Charaxes jasius*, 217; of *Hydriomena furcata*, 84, 110; of *Thecla pruni* ... 73

Life-history of *Metocens (Rhipiphorus) paradoxus* ... 321

Limnitis sibylla, Dark aberration of *Lita intermediella*, Notes on ... 36

Lithocolletis larvæ in autumn of 1896, Abundance of ... 61

<i>Lithosia lutarella</i> and its var. <i>pygmaeola</i>	140
Living larvae of <i>Purranthis plumistraria</i> and <i>Hemerophila abruptaria</i> ...	213
Llangollen (Valley of the Dee), Collecting at	49
Local Coleoptera from Richmond Park	129
Locusts as an article of food	71
<i>Lophopteryx carmelita</i> at West Wickham	154
<i>Lycaena arion</i> in the Cotswolds, 101; New locality for	335
<i>Macroglossa bombyliiformis</i> in co. Cork	266
Malformation of <i>Pieris brassicae</i> ...	213
Melanic <i>Dianthocia capsophila</i> , 46; <i>Eupithecia virgaurea</i> , 331; <i>Thera obeliscata (variata)</i> , 330; <i>Triphaena orbona</i> from Slough, 118; aberrations in Yorkshire ...	327
<i>Melanippe montanata</i> , Notes on ...	213
<i>Melitaea aurinia</i> in Ireland ...	
<i>Miana bicoloria</i> and its form <i>rufuncula</i> , Query as to	39
Micro-lepidoptera from Lancashire ...	71
Mixtures for sugaring	121
Mode of progress of larva of <i>Thecla pruni</i>	74
Moth traps	93
Moths attracted by electric light ...	47
Moths from Bourg d'Oisans, 140, 173; from La Grave, 228; from Le Lautaret	13
Moulting of <i>Charaxes jasius</i>	217
Myrmecophilous Coleoptera in 1897 ...	246
Nature of pigments of Lepidoptera, Probable physical and chemical ...	160
<i>Nemecophila plantaginis</i> , Black aberration of, 187, 260; ab. <i>hospita</i> , 261; Varieties of, 187; ab. <i>hospita</i> and ab. <i>rufa</i> ? A query ...	330
Nest of a gregarious Europterid moth, On a larval	127
Neuration of Butterflies, 241; of Lepidoptera, 255; of Rhopalocera ...	4
New British fleas (<i>Tryphlopsylla pentacanthus</i> and <i>T. dasycnemus</i>) ...	55
New British species of Diptera (<i>Micropalpus pudicus</i>), 47; of the Gelechiidae (<i>Lita intermediella</i>) ...	36
New Forest in 1896	62
<i>Noctua ditrapezium</i> in South Yorkshire (?) (afterwards corrected.—Ed.)	20
Notes from Broxbourne, 295; from Carlisle, 238, 297, 333; from Dover, 267; from Isle of Man, 209; from New Forest, 296; from Shere, 269; from Tuddenham, 267; from Wicken, 296; from Wyre Forest, 269; from Yorkshire, 67; on the Zygaenides ...	87, 103

Number of broods of <i>Erebia epistygne</i> , 281; of <i>P. e-album</i> , 281; of <i>Polygonia egea</i>	281
<i>Nyssia zonaria</i> , Notes on, 70; taken near Liverpool	48
OBITUARY:—Albert Houghton, 124; James B. Hodgkinson, F.E.S., 125; John Finlay	270
Observations made in Switzerland, August, 1896, Some	25
Occurrence of <i>Tephrosia crepuscularia (biundularia)</i> in Ireland, On the	322
Ocellation of <i>Erebia neoridas</i> , On the	79
<i>Oecophora stipella</i> in the Alps ...	15
<i>Oporabia filigrammaria</i> , Variation of	61
<i>Oporabia nebulata</i> and <i>O. filigrammaria</i> , Exhibition of and notes on ...	185
<i>Oporabia</i> , The genus	247, 282, 315
Organs of <i>Tephrosia bistortata</i> and <i>T. crepuscularia</i> , The genital ...	205
Orthoptera captured in the neighbourhood of Cannes, in March ...	226
Oxshott in June	213, 239
Papers, Entomological for 1896 ...	3
<i>Pararge maera</i> , New aberration of ...	260
<i>Pararge megera</i> and <i>P. maera</i> inhabiting the same ground	79
<i>Pararge megera</i> , Habits of in Britain	252
<i>Peronea permutana</i> on Barnes Common	209, 269
<i>Phigalia pedaria</i> , Black aberration of, 118; Variation of	117
<i>Phorodesma pustulata</i> at Brondesbury	297
<i>Phothedes captiuncula</i> , Notes on ...	328
Photograph of <i>Brachycerus apterus</i> ...	129
<i>Phycis oblitella</i> among some bought <i>Rhodophaea suavelia</i>	64
<i>Pieris daphidice</i> at Dover	269
Pigment, Development of, within scales	159, 198
Pigment of wing-scales in Lepidoptera	78
Pigments of Lepidoptera, Development of	131, 159
<i>Plastenis subvusa</i> , Notes on	332
<i>Platyptilia tesseradactyla</i> in Ireland ...	71
<i>Plebeius aegon</i> var. <i>corsica</i> in Westmoreland	294
Plumes of an Alpine Valley, The ...	228
<i>Plusia festucae</i> double-brooded, 40; Aberration of	118
<i>Plusia moneta</i> near Rochester, 266; at Watford	23
<i>Podisus luridus</i> , Carnivorous habit of	64
<i>Poecilocampa populi</i> taken at Dorking ...	48
<i>Polia xanthomista</i> var. <i>nirocineta</i> from the egg, Rearing	89

<i>Polygonia c-album</i> , Aberrations of ...	38
<i>Polyommatus astrarche</i> ab. <i>quadripunctata</i> in Kincardineshire ...	330
<i>Polyommatus escheri</i> , Abundance of ...	202
<i>Polyommatus iolas</i> in Switzerland ...	40
<i>Polyommatus</i> (<i>Plebeius</i>) <i>zephyrus</i> var. <i>lycidas</i> ...	294
<i>Portheia chrysorrhoea</i> on oak ...	185
<i>Portheia dispar</i> as a British insect ...	21
Portland, Collecting at ...	19
Probable origin of certain ocellated spots in the larvæ of <i>Odonestis potatoria</i> , 287; of <i>Lasiocampa quercus</i> ...	287
Proposed new grouping of <i>Lepidoptera</i> ...	196
Protection of insects in danger of extermination, Committee for ...	130
Protection <i>versus</i> Extermination ...	337
Protective advantage of the colours assumed by the melanic form of <i>Stauropus fagi</i> ...	207
Protective resemblance of <i>Charaxes jasius</i> ...	217
Protective resting habit of <i>Lithomia solidaginis</i> ...	326
<i>Ptinus brunneus</i> , Duft., captured in Surrey ...	260
Pupa of <i>Amblyptilia acanthodactyla</i> , 264; of <i>Charaxes jasius</i> , 185; of <i>Dasychira pudibunda</i> , 295; of <i>Demas coryli</i> , 295; of <i>Eupithecia dodoneata</i> , 295; of <i>Eupithecia fraxinata</i> , 265; of <i>Eurymene dolobravaria</i> , 295; of <i>Hydriomena furcata</i> , 111; of <i>Leiocampa dictæa</i> , 295; of <i>Lophopteryx camelinæ</i> , 295; of <i>Nemobius lucina</i> , 336; of <i>Notodonta trepida</i> , 294; of <i>Pocilocampa populi</i> , 295; of <i>Ptilodontis palpina</i> , 295; of <i>Saturnia pyri</i> , 144; of <i>Taenioocampa populæti</i> , 295; of <i>Thecla pruni</i> , 75; of <i>Trochilium apiforme</i> ...	260
Pupa-digging in Ireland ...	64
Pupation of <i>Charaxes jasius</i> , 217; of <i>Tiresias serra</i> ...	162
Rare species of <i>Lepidoptera</i> from Merton ...	129
Rearing <i>Polia xanthomista</i> var. <i>nigroincta</i> ...	39
Retarded emergence of <i>Petasia nubeculosa</i> , 182; of <i>Nyssia hispidaria</i> ...	182
Retrospect of a <i>Lepidopterist</i> for 1896 ...	1
REVIEWS AND NOTICES OF BOOKS:— Das Studium der Braconiden, von Dr. O. Schmeideknecht, 158; Die Deutschen Pterophorinen, von Dr. Ottmar Hofmann, 72; Die Schmetterlings-fauna von Hildesheim, by A. R. Grote, M.A., 241; Faune de France, by A. Acloque, 270; Harrow Butterflies and	

Moths, Vol. ii., by J. L. Bonhote, M.B.O.U., and Hon. N. C. Rothschild, F.Z.S., F.E.S., 186; List of Portland <i>Lepidoptera</i> , by Nelson Richardson, B.A., F.E.S., 184; Mechanical Selection and other Problems, by Karl Jordan, Ph.D., 130; The development of the wing-scales and their pigment in Butterflies and Moths, by Alfred Goldsborough Mayer ...	131
<i>Rhodophaea rubrotibicella</i> , Notes on ...	329
Rhopalocera found in the Basses-Alpes (Digne), 221; of the Guildford district, 310; from La Grave ...	202
Rhynchota-Heteroptera collected at Cannes ...	256
Sale of Mr. C. A. Briggs' collection, 41; of J. B. Hodgkinson's collection ...	336
Sallows in York district ...	268
<i>Saturnia pavonia</i> , Assembling of ...	260
Scales of European <i>Zygaenides</i> , On the ...	271
Scales of <i>Lepidoptera</i> , Development of ...	131, 159
Second broods in 1896 ...	42
<i>Senta maritima</i> ab. <i>bipunctata</i> from Southend ...	118
Silk of <i>Tephrosia bistortata</i> ...	130
<i>Sirex juvenis</i> in Bostall Woods ...	332
<i>Smerinthus tiliaæ</i> (♀) with <i>S. populi</i> (♂), Pairing of ...	233
SOCIETIES:—Cambridge Entomological and Natural History Society, 24, 45, 100, 157; City of London Entomological and Natural History Society, 48, 68, 97, 127, 156, 185, 212; Committee of Ent. Soc. of London for Protection of British <i>Lepidoptera</i> , 24, 130, 214; Congress of South Eastern Union of Scientific Societies, 184; Entomological Society of London, 45, 71, 129; Nonpareil Entomological Society, 129, 214; North London Society, 47, 129; Royal Society, 204; South London Entom. and Natural History Society ...	46, 71
South African insects ...	24
Species, Varieties and Aberrations, new to science:— <i>Abraxas sylvata</i> (<i>ulmata</i>) ab. <i>intermedia</i> , Tutt, 307; ab. <i>obscura</i> , Tutt, 307; ab. <i>suffusa</i> , Tutt, 307; ab. <i>transversa</i> , Tutt, 307; <i>Crambus culmellus</i> ab. <i>obscura</i> , Tutt, 230; <i>Hydriomena furcata</i> (<i>sordidata</i>) ab. <i>cinerata</i> , Prout, 86; ab. <i>obliterata</i> , Prout, 86; ab. <i>sordidata-albifasciata</i> , Prout, 87; ab. <i>testacea</i> , Prout, 86; <i>Lila intermediella</i> , Hodgk. (? <i>Lila fraternella</i> , Ed.), 36, 71; <i>Lithosia complana</i> ab. <i>pallida</i> , Tutt, 141;	

<i>Megacrasedus tutti</i> , Walsm., 140, 231; <i>Melanthia bicolorata</i> ab. <i>fumosa</i> , Prout, 201; <i>Nemeophila plantaginis</i> ab. <i>alba-matronalis</i> , Tutt, 191; ab. <i>alba-obsoleta</i> , Tutt, 191; ab. <i>flava</i> , Tutt, 191, ab. <i>flava-matronalis</i> , Tutt, 191; ab. <i>flava-obsoleta</i> , Tutt, 191; ab. <i>lutea-obsoleta</i> , Tutt, 191; ab. <i>rufa</i> , Tutt, 191; ab. <i>rufa-matronalis</i> , Tutt, 191; ab. <i>rufa-obsoleta</i> , Tutt, 191; <i>Pararge naera</i> ab. <i>obscura</i> , Tutt, 260; <i>Stauropus fagi</i> ab. <i>obscura</i> , Tutt, 208; ab. <i>virgata</i> , Tutt, 208; <i>Tryphlopsylla dasyneumus</i> , Roths., 159; <i>T. pentacanthus</i> , Roths. ... 55	<i>Tephrosia bistortata</i> (<i>crepuscularia</i>) as a Scotch insect, 258; at Reading, 124; Ovum and larva, 243; Second brood of ... 245
Specific distinction of <i>Gonepteryx cleopatra</i> , On the ... 329	<i>Tephrosia crepuscularia</i> (<i>biundulata</i>) in Ireland, 64; in Morayshire, 93; not in Morayshire, 127; Ovum and larva ... 277
Specific distinctness of <i>Micropteryx salopiella</i> and <i>M. unimaculella</i> ... 151	<i>Thanaos tages</i> double-brooded on Continent ... 253
<i>Sphinx convolvuli</i> at Chichester, 267; at Clevedon, 23; at Barnsley, 333; Notes on, 265, 269; Resting habit of ... 228	<i>Thyridopteryx ephemeraeformis</i> at Washington, U.S.A. ... 24
<i>Spilothyrus alceae</i> at Bourg d'Oisans 253	<i>Tiliacea</i> (<i>Xanthia</i>) <i>aurago</i> and its aberrations, 294; near Bath ... 21
Spring collecting and observations in co. Cork, Result of ... 266	Time of appearance of some Butterflies at Hyères, Notes on the ... 37
Spring Hymenoptera from Southern France ... 230	<i>Tinea ruricolella</i> , Notes on ... 330
Spring Lepidoptera at Carlisle, 182; at Hyères, 303; at Reading, 154, 183; at Swansea ... 183	<i>Tortrix serra</i> bred ... 212
Spring Moths ... 157	<i>Tortrix viburniana</i> , Notes on ... 14
Spring Odonata from Southern France ... 239	Trapezoidal tubercles of <i>Saturnia</i> 148
Spring Rhopalocera from the Riviera, On a collection of ... 249	Value of larval characters, On the 286
Statistician wanted, A ... 89	Varieties in the <i>Larentiidae</i> , Some named ... 200
<i>Stauropus fagi</i> at Reading ... 265	Variation of British Butterflies ... 331
<i>Strenia immorata</i> , Notes on ... 16	Variation of <i>E. neoridas</i> , 82; of <i>Hydriomena furcata</i> , 84, 110; of <i>Oporabia filigrammaria</i> , 61; of <i>Oporabia nebulata</i> , 815; of <i>Spilosoma lubricipeda</i> , 47; of <i>Stauropus fagi</i> , 207; of <i>Zygaena exulans</i> ... 13
Stridulatory organ in the larva of <i>Geotrufes</i> ... 100	Wallasey (Liverpool), A few days' collecting at ... 49
Sugaring in York district ... 268	West of Scotland, Notes from ... 17
Summer emergence of <i>Gonepteryx cleopatra</i> , On the ... 329	Wing-expansion of <i>Zygaena trifolii-major</i> , On the ... 234
Synonymy of <i>Hydriomena furcata</i> (<i>Hyphipetes sordidata</i>), 84; of <i>T. bistortata</i> and <i>T. crepuscularia</i> ... 56	Wing-scales of Lepidoptera ... 78
<i>Taeniocampa opima</i> at Canvey ... 183	Wings of Lepidoptera, Development of ... 130, 159
<i>Taeniocampa populeti</i> at Wimbledon 156	Winter habits of <i>Cobias edusa</i> , 280; of <i>C. hyale</i> , 280; of <i>Gonepteryx cleopatra</i> ... 280
<i>Taeniocampa stabilis</i> , <i>Demas coryli</i> , and <i>Ennomos quercinaria</i> , Heredity notes relating to ... 97	<i>Xyleborus saxexeni</i> from Richmond Park ... 156
<i>Tanagra atrata</i> at Brondesbury ... 297	Yellow and white-coloured moths on mountain pastures, Abundance of ... 228
<i>Tephrosia bistortata</i> and <i>T. crepuscularia</i> , Are they distinct species? 150, 215, 243, 278; at Reading, 183; Bred series of, 185; Breeding notes relating to, 328; Critical resumé of arguments as to their being distinct species 6, 28, 55; Crossing of, 150, 278; 310; Discussion on, 47; Eggs of, 127, 150, 215, 243, 278; From the London district, 46; Further notes on, 149; Larvæ of ... 243	<i>Zeugophora flavicollis</i> at Colchester 71
	<i>Zygaena hippocrepidis</i> , St., probably a hybrid form between <i>Z. trifolii</i> and <i>Z. filipendulae</i> , 103; is it a distinct British species, 87; Remarks on ... 169
	<i>Zygaena lonicerae</i> as a constant species, 87, 166; compared with <i>Z. medicaginis</i> , 167; hybridises with <i>Z. trifolii</i> ... 168
	<i>Zygaena medicaginis</i> as a distinct species, 168; Six-spotted specimens of ... 169
	<i>Zygaena ochsenheimeri</i> compared with <i>Z. medicaginis</i> ... 168
	<i>Zygaena trifolii-major</i> , Aberrations of... 261
	<i>Zygænes</i> , Notes on the, 166; of the Buttier Valley ... 170

LIST OF PLATES.

	PAGE
Plate I.—Neuration of the Rhopalocera: To be placed opposite	1
Plate II.—Larva and Pupa of <i>Thecla pruni</i>	73
Plate III.—Development of the wing and wings-scales in Butterflies and Moths	131
Plate IV.—A new British Flea (<i>Tryphtopsylla dasyncnemus</i>)	159
Plate V.— <i>Nemophila plantaginis</i> , its Aberrations and Varieties	187
Plate VI.—Ova of <i>Tephrosia crepuscularia</i> and <i>T. bistortata</i>	215
Plate VII.—Scales of European Zygenides	271

INDEX TO LOCALITIES.

	PAGE		PAGE
Aberdeenshire	20, 63	Ireland	64 (twice), 71
Arolla	25	Isle of Dogs	156
Barnes Common	209, 269	Isle of Man	209
Bath	21	Kent	122
Bérisal	297	King's Lynn	23, 184
Bourg d'Aru	52	La Grave	202, 228
Bourg d'Oisans	79, 140, 173	Le Lautaret	13
Bournemouth	39	Les Avants	25
Brampton	333	Llangollen	50
Brockenhurst	48	Loughton	48
Brondesbury	297	Mallow	183
Broxbourne	295	Merton	129
Bury St. Edmunds	23	Morayshire	93
Buttler Valley	170	Navestock	332
Caithness	62	New Forest	20, 62, 93, 157, 210, 296
Cannes	226, 239, 256, 267	Orkney Islands	72, 93
Canvey	90	Oxshott	213, 239
Carlisle	182, 238, 269, 297	Perth	258
Ceylon	48	Portland	19
Cheshire	70	Queenborough	184
Cheshunt	239	Reading	40, 124, 154, 188, 265, 334
Chichester	267	Richmond Park	129
Church Stretton	65	Riviera, The	249, 279
Clevedon	23	Rochester	266
Colchester	71	Romanche Valley	83
Cork	266	Saas Fée	297
Cotswolds	101, 332	Sandown	296
Cumberland	91	Shere	269
Dauphiné Alps	13, 52, 79, 140, 173	Slough	93, 118
Devonshire	19	Southend	90, 118
Digne (Basses-Alpes)	185, 221, 239, 267	Switzerland	40
Doncaster	23	Tuddenham	267
Dover	267, 269	Wallasey	50
East of Scotland	18	Waltham Cross	23
Emsworth	23	Watford	23
Epping Forest	129	Westmoreland	261, 294
Evolena	25	West of Scotland	17
Farnborough	333	West Wickham	154
Folkestone	91	Wicken	214, 296
Galway	63	Wisbech	332
Gloucester	335	Wimbledon	156
Guildford	123, 310	Wyre Forest	269
Hampstead	20	Yarmouth	64
Hyères	303	York District	20, 23, 46, 67, 268, 304, 332

LIST OF CONTRIBUTORS, Etc.

	PAGE		PAGE
Adkin, Robert, F.E.S.	324	Atmore, E. A., F.E.S.	23, 184
Alderson, Hope, F.E.S.	333	Bacot, A.,	38, 97, 144, 148, 178,
Allen, J. E. R.	323		287, 293, 299
Anderson, Joseph (Jun.)	267	Banks, Eustace, R., M.A., F.E.S.,	
Ash, (Rev.) C. D., M.A.	23, 62, 97		40, 330 (twice)

	PAGE		PAGE
Barnes, W. ...	40, 183	Harrison, Edward S. ...	83, 267, 293, 294, 335
Barrett, Chas. G., F.E.S.	41, 130, 214	Harrison, J., F.E.S.	... 334
Bartlett, Chas. ...	328	Hart, (Prof.) G. T., L.L.D., F.E.S.	322
Bateson, W., M.A., F.R.S., F.E.S.	328	Heasler, H. ...	98
Bath, W. Harcourt ...	41	Hewett, William ...	20, 107, 142, 171, 304
Baty, T. E. ...	178	Hill, H. Ainslie, F.Z.S., F.E.S.	20, 154
Bayne, A. F. ...	93	Hills, Stuart G. ...	39
Bazett, (Mrs.) E. C. ...	294	Hodgkinson, J. B., F.E.S.	36, 40, 64, 65
Beadle, H. ...	91, 118, 121	Horne, A., F.E.S.,	19, 63, 93, 259, 261, 330 (twice)
Beare, (Professor) T. Hudson, B.Sc., F.R.S.E., F.E.S.	... 49	Howard, L. O. ...	17
Bird, C. A. ...	35	Kane, W. F. de V., M.A., F.E.S.	36, 63, 64, 146, 324
Bird, J. F. ...	20	Kaye, W. J., F.E.S.	... 207
Bouskell, F., F.E.S.	... 118	Kirkaldy, G. W., F.E.S.	... 256
Bowell, E. W. Wake ...	94, 121, 271	Lawson, R. ...	... 258
Bower, Benjamin A., F.E.S.	... 89	Lowe, (Rev.) Frank E., M.A., F.E.S.	59
Bowles, E. A., M.A., F.E.S.	23, 42, 61, 178, 180, 326	Lucas, W. J., B.A. ...	239
Bright, P.M., F.E.S.	... 39	Maddison, T. ...	182, 325, 326
Brown, E. W. (Capt.) ...	322	Mason, J. ...	23 (twice), 326
Brown, H. Rowland, M.A., F.E.S.	25, 290, 294, 297	Mera, A. W. ...	22, 61, 181
Buckell, F. J., M.B., B.S.	... 99	Merrifield, Frederic, F.E.S.	... 89
Buckmaster, (Rev.) C. J., M.A.	... 303	Merrin, J., F.E.S.	101, 154, 329, 332, 335
Bull, John ...	273	Moberly, J. C., M.A., F.E.S.	20, 61 (three), 62, 179, 296, 326
Burr, Malcolm, F.E.S.	... 226	Morley, Claude, F.E.S.	10, 32, 114, 232, 307
Burrows, (Rev.) C. R. N.	36, 180	Murray, H. ...	39, 294
Bush, E. R. ...	259	Newland, C. Bingham	183, 260, 266 (twice)
Butler, W. E. ...	124, 149, 154, 261, 265	Newnham, F. B., M.A.	67, 333
Butterfield, J. A., B.Sc.	118, 327	Nicholl, (Mrs.) M. ...	329 (twice)
(twice), 328, 330, 332 (twice), 335		Norgate, Frank ...	23, 266
Chapman, T.A., M.D., F.E.S.	78, 94, 192, 217, 259, 269, 321	Page, Herbert E., F.E.S.	... 92
Cheesman, E. M. ...	93, 94	Page, (Mrs.) Rosa E., B.A.	... 268
Christy, W. M., M.A., F.E.S.	22, 23, 63, 326	Partridge, (Colonel) Chas. E.	... 40
Clarke, H. Shortridge, F.E.S.	... 209	Postans, R. D. ...	41
Clarke, J. ...	124 (twice), 183, 261, 335	Prout, Louis B., F.E.S.	84, 110, 162, 200, 240, 247, 267, 282, 290, 297, 315
Claxton, (Rev.) W. ...	332	Pyc, (Miss) Clara E. ...	266
Cockerell, (Prof.) T. D. A., F.Z.S., F.E.S.	... 331	Quail, Ambrose ...	4
Corbett, H. H., M.R.C.S.	23, 95, 326	Raynor, (Rev.) G. H., B.A.	... 21
Cottam, Arthur ...	23	Richardson, Nelson M., B.A., F.E.S.	19, 42, 179
Cowie, Wm. ...	21	Riding, W. S., B.A., M.D., F.E.S.	20, 119, 149, 151, 238, 243, 277, 319, 325
Craibtree, B. H., F.E.S.	... 261	Robertson, (Major) R. B.,	181, twice, 326
DalGLISH, A. Adie ...	18, 179	Robinson, Arthur, B.A., F.E.S.	... 89
Dawe, F.S., B.Sc.	... 335	Robson, J. E., F.E.S.	... 63
Day, F. H. ...	94, 183, 239, 269, 298	Rothschild, The Hon. N. C., F.Z.S., F.E.S.	... 55, 159
Day, Geo. O. ...	267 (twice)	Routledge, G.B., F.E.S.	... 333
Dennis, George C., F.E.S.	... 67	Sampson, Albert ...	154
Donisthorpe, Horace, F.Z.S., F.E.S.	49, 77, 162, 246, 260, 276	Saunders, E., F.L.S., F.E.S.	... 239
Dupont, L. ...	329 (twice)	Sheldon, W. G. ...	336
Dutton, R. ...	269	Stockwell, H. Douglas ...	123, 267
Dyar, Harrison G., Ph.D.	... 136	Studd, E. F., M.A., B.C.L., F.E.S.	22, 137, 146, 325
Esam, W. W. ...	40, 64		
Farn, A. B., F.E.S.	... 335		
Fenn, Charles, F.E.S.	22, 179, 182, 325		
Gardner, J., F.E.S.	... 328		
Greer, T. ...	22		
Grote, (Professor) A. R., M.A.	72, 255, 286		
Grover, W. ...	124, 234, 235, 310		
Hamm, A. H.,	42, 94, 122, 152, 155		

CONTENTS.		347
PAGE		PAGE
Thornhill, W. B.	9, 39, 64 (twice)	Vivian, H. W., B.A., F.E.S. 331, 334
Todd, (Rev.) E. Hallett, M.A.	... 148	Walker, S. ... 332
Tremayne, Lawrence J.	212, 239, 240, 270, 296, 297	Walker, J. J., F.L.S., F.E.S. ... 184
Tuck, W. H., M.A.	260, 266, 289, 318	Walsingham, The Rt. Hon. Lord, M.A., L.L.D., F.R.S. etc. 140
Tutt, J. W., F.E.S.	1, 6, 13, 24, 28, 36, 37, 38, 39, 42 (twice), 52, 55, 58, 59, 61, 67, 73, 79, 87, 90, 94, 96, 103, 112, 117 (twice), 120, 131, 140, 148, 151 (twice), 152, 159, 166, 173, 177, 180, 187, 194, 198, 202, 205, 207, 208, 215, 221, 228, 234, 237, 240, 249, 257, 259, 260, 264 (twice), 279, 292, 294, 296, 305, 324, 336	Warburg, J. C. ... 41
		Waters, Albert H., B.A. 38, 64 (twice)
		Webb, Sydney ... 23, 151, 153
		Whittle, F. G. ... 89, 91, 118, 183
		Williamson, J. B. ... 93, 118 (twice)
		Winterbotham, L. L. ... 154
		Wolfe, J. J. 184, 205, 207 (twice)
		Wood, H. L. ... 337
		Wylie, J. ... 259

The Entomologist's Record and Journal of Variation.

VOL. IX.

SPECIAL INDEX.

Coleoptera arranged in order of Genera. The other orders arranged by Species.

COLEOPTERA.				PAGE				PAGE
Abax striola	...	...	...	212	Bembidia	...	...	50
Acanthocinus aedilis	...	...	...	115	Bembidium	...	...	11
Adimonia capreae	...	...	...	212	atrocaeruleum	...	...	51
Agabus	...	...	...	12	biguttatum	...	...	12
bipustulatus <i>var. solieri</i>	...	...	...	51	decorum	...	...	51
conspersus	...	...	...	12	minimum	...	...	11
paludosus	...	...	...	12	prasinum	...	...	50
Aleochara moesta	...	...	...	155	punctulatum	...	...	50
sparsa	...	...	...	155	Blaps mucronata	...	...	77, 78
succicola	...	...	...	155	similis	...	...	77, 78
Alphitobius piceus	...	...	...	78	Blechnus maurus	...	...	233
Amalus scortillum	...	...	...	233	Bledii	...	...	12
Amara acuminata	...	...	...	77	Bledius	...	...	12
Amphotis marginata	...	...	...	247	Brachelytra	10, 11, 12, 212,	308	
Anaspis flava	...	...	232, 233		Brachypterus gravidus	...	...	233
<i>var. thoracica</i>	...	...	232, 233		Bradycellus cognatus	...	...	50
subtestacea	...	...	233		collaris	...	...	50
Anchomenus albipes	...	...	11		similis	...	...	50
fuliginosus	...	...	11		Bruchus cisti	...	...	233
marginatus	...	...	11		lentis	...	...	129
prasinus	...	...	11		pisi	...	...	78
viduus <i>var. moestus</i>	...	...	11		rufimanus	...	...	78
Anobium domesticum	...	...	78		sp. (?)	...	...	78
fulvicorne	...	...	232		Calandra granaria	...	...	78
paniceum	...	...	77, 78		oryzae	...	...	78, 233
Anoplodera sexguttata	...	...	212		Calathus	...	...	212
Antherophagus pallens	...	...	232		cisteloides	...	...	77
Antheicus floralis	...	...	78, 233		flavipes	...	...	50
Anthobium ophthalmicum	...	...	232		micropterus	...	...	50
Anthocomus fasciatus	...	...	78		Callidium violaceum	...	...	115
Anthrenus varius	...	...	78		Calosoma inquisitor	...	...	212
Aphodius lapponum	...	...	50		Campylus linearis	...	...	212
plagiatus	...	...	12		Carabidae	...	...	34
Apion	...	...	11		Carabus arvensis	...	...	51
loti	...	...	233		catenulatus	...	...	50
punctigerum	...	...	233		glabratus	...	...	50
Aromia moschata	...	...	115		lusitanicus	...	...	71
Asenum striatum	...	...	210, 276		Cassida viridis	...	...	78
Athous longicollis	...	...	233		Cerambyx heros	...	...	116
Attagenus pelio	...	...	77		Ceratorrhina polyphemus	...	...	185
Attelabus cureulionides	...	...	212		Ceuthorrhynchus asperifoliarum	...	...	233
Badister unipustulatus	...	...	12		cyanipennis	...	...	233
Bagos diglyptus	...	...	309		litura	...	...	11
Balaninus glandium	...	...	212		marginatus	...	...	232
Baris abrotani	...	...	232		Chalocosoma atlas	...	...	185
Batocera wallacei, <i>var.</i>	...	...	185		Chiacognathus granti	...	...	185
Batophila aeruti	...	...	233		Chlaenius vestitus	...	...	11
Batriscus venustus	...	...	247		Chrysomela fastuosa	...	...	78
					graminis	...	...	78
					Cicindela hybrida	...	...	49, 50

	PAGE		PAGE
maritima	50	Heteromera	212
Clavicornia	308	Heterothops quadripunctata	246, 247
Cleonus nebulosus	46	Homalium rugulipenne	50
Clerus formicarius	34	Homalopia ruficollis	233
Clivina fossor	12	Homalota	11, 308
Clythra quadripunctata	212	(Gynepta) caerulea	12
Clytus arietis	115, 212	Hydradephaga	12, 309
Coccinella distincta	247	Hydroporus nigrata	51
Corticaria fulva	77	Hylastes ater	33
Corymbites aeneus	51	palliatu8	34
holosericeus	212	Hylastinus obscurus	34
quercus	50	Hylesinus crenatus	34, 309
Creophilus maxillosus	77, 212	Hylobius abietis	212
Crepidodera chloris	233	Hylotrupes bajulus	115
helxines	233	Hylurgus piniperda	32
Cryphalus abietis	34	Hypera plantaginis	233
Cryptocephalus lineola	212	Hypophloeus bicolor	34
Cryptohypnus riparius	60	depressus	78
Cryptophagi	319	fraxini	34
Cryptophagus affinis	77	Laemophloeus ferrugineus	77
badius	77	pusillus	77
cellaris	77	Lagria hirta	212
saginata8	77	Lamellicornia	212
Cychnus rostratus	51	Lasioderma serricorne	233
Cymindis vaporariorum	51	Latheticus oryzae	78
		Lathridius minutus	77
Dasytes plumbaeus	233	ruficollis	77
Dendrophilus punctatus	77	Lathrobium	11, 12, 50
pygmaeus	247	brunnipes	50
Dermestes	77	terminatum	50
lardarius	77	Leistus fulvibarbis	50
vulpinus	77	Lema erichsoni	185
Dermestidae	162	septrionis	185
Dianous caeruleascens	51	Leptacinus formicetorum	247
Dinarda maerkeli	246	Lesteva pubescens	51
Dolichosoma nobile	212	Lissodema 4-pustulata	232
Dromius	98	Longicornia	71, 114, 116, 212
4-maculatus	212	Lucanus cervus	212
4-notatus	98		
Dryocoetes villosus	156	Malachius viridis	233
Dyschirri	12	Malacodermata	212
		Malthodes atomus	232
Elaphrus cupreus	11	Mantura matthewsi	233
riparius	11	Megatoma undata	78
Elateridae	212	Meligethes murinus	233
Erirrhinus acridulus	12	Meloë	321, 322
bimaculatus	211	Melolontha vulgaris	114, 212
maculatus	212	Metoeus (Rhipiphorus)	322
tortrix	212	paradoxus	318, 321, 322
vorax	34	Mezium affine	78
Eurytrachelus titan	185	Miarus campanulae	232
Exomias (Barypetthes) araneiformis	185	graminis	233
pyrenaeus	185	Microglossa gentilis	246
		pulla	246
Geodephaga ... 10, 11, 12, 212, 308		Miscodera	51
Geotrupes vernalis	212	arctica	51
Gnathocerus cornutus	78	Microzoum tibiale	50
Gnathoncus punctulatus	77	Monotoma conicicollis	247
Goliathus druryi	185	formicetorum	247
Gymnusa variegata	50	Mordellistena pumila	233
		Mycetaea hirta	77
Harpalus	212	Mycetophagus quadriguttatus	77
rubripes	212	Myrmedonia cognata	246
ruficornis	77	funesta	246
Heteroceri	12		

	PAGE
humeralis	246
laticollis	246
lugens	246
Myrmetes piceus	129, 247
Necrobia	77
ruficollis	78
rufipes	78
Necrophaga	212
Niptus crenatus	78
hololeucus	78
Notiophilus	212
Notothecta anceps	246
confusa	246
flavipes	246
Ocypus	12
brunnipes	50
Odontolabis cuvera	185
Oedemera lurida	233
Olisthopus rotundatus	51
Omalius concinnus	77
deplanatus	77
Orchestes alni	233
var. ferrugineus	233
fagi	232
rusci	233
Otiorrhynchus	71
picipes	212, 309
Oxypoda formiceticola	246
haemorrhoea	246
vittata	246
Palpicornia	13, 209
Parnidae	13
Parnus auriculatus	12
Perileptus areolatus	51
Philonthus	11
bipustulatus	51
lucens	309
Phloeophagus aeneopiceus	78
Phloeophorus rhododactylus	34
Phyllopertha horticola	212
Phyllotreta nodicornis	232
ochripes	233
Phytodecta viminalis	212
Phytophaga	114, 212
Pityophthorus micrographus	34
Placusa pumilio	156
Platystethus alutaceus	155
Podagrica fuscicornis	233
Pogonocherus hispidus	51
Pogonus	12
Prasocures	12, 309
Prasocuris aucta	12
Pristonychus terricola	77
Pterostichus	50, 212
aethiops	50
anthracinus	12
madidus	50
nigrita	12, 50
strenuus	12, 50
vitreus	50
Ptilinus pectinicornis	233
Ptinus... ..	260

	PAGE
brunneus	260
fur	78
subpilosus	260
Quedius brevis	247
fulgidus	77
fuliginosus	77
Rhagium	115
bifasciatum	212
inquisitor	116, 212
Rhizophagus ferrugineus	129, 156
Rhizopertha pusilla	78
Rhynchites pubescens	212
Rhyncolus lignarius	233
Rhyncophora	212
Saperda	115
carcharias	115
populnea	115
Saprinus	212
Scolytidae	32, 35, 114, 308
Scolytus destructor	34
intricatus	34
multistriatus	34
Silpha 4-punctata	212
rugosa	212
sinuata	212
Silvanus surinamensis	77
Sitaris	321
Sitones griseus	50
Sphodrus leucophthalmus	77
Stenus	11, 12
guynemeri	51
nitidiusculus	12
Strangalia nigra	212
Strophosomus coryli	212
Tachinus elongatus	50
Telephorus obscurus	50
Tenbrio molitor	77, 78
obscurus	77, 78
Tenebriades (Trogosita) mauritanica	77
Teredilia	308
Thiasophila angulata	246
Tiresias serra	162, 212
Tomicus typographus	34
Toxotus meridianus	212
Trachys troglodytes	309
Tribolium ferrugineum	78
Trox sabulosus	212
Velleius	319
dilatatus	318, 319
Xyleborus saxaseni... ..	34, 156
Xylotrupes dichotormus	185
Zeugophora flavicollis	71

DIPTERA.

Atylotus	46
autumnalis ?, Tabanus	210

	PAGE
bombylans, Volucella	211
var. plumata	211
borealis, Serycomyia	211
Culex	16
Culicidae	16
dasyneumus, Typhlopsylla (with plate)	160
equestris, Morodon... ..	212
fenestralis, Scenopinus	46
florea, Myiatropa	211
major, Bombylius	212
nemorosus, Culex	17
oelandica, Dioctria	211
oxyacanthae, Criorrhina	211
pentacanthus, Typhlopsylla	55
pudicus, Micropalpus	47
speciosa, Spilomyia	211
spodopterus, Tabanus	46
Syrphidae	211
Tipula	64
versicularis, Conops	211

HEMIPTERA.

Acanthosoma	212
agilis, Stenocephalus	257
aurora (?), Psallus	257
bidentata (bifurcata), Pygolampis	257
calyptroides, Diaspis	119
Capsidae	257
Coreidae	257
custos, Arma	257
cydoniae, Aspidiotus	119
decorata, Strachia	257
fuscispina, Pentatoma	256
gibbifera, Gerris	257
griseus, Rhaphigaster	257
hederae, Aspidiotus	44
hybridus (stridulus), Pirates	257
Hydrometridae	257
laticeps, Henestaris	257
lituratus (incarnatus), Piezodorus	257
luridus, Podisus	64
Lygaeidae	257
militaris, Lygaeus	257

	PAGE
najas, Gerris	257
oleracea, Strachia	257
Pentatomidae	256
prasina, Pentatoma	257
Psallus	257
Reduviidae	257
resedae var. geminatus, Ischnorhynchus	257
stagnorum, Hydrometra	257
tomentosus, Coccus	119
urticae, Heterogaster	257
viridula, Nezara	257
viridulus, Nabis	257

HYMENOPTERA.

abdominalis, Phygadeum	10
agrorum, Bombus	289
albilabris, Ceratina	239
alticola, Bombus	44
Bracon	158
Braconidae	158
chalcites, Ceratina	239
cinctus, Caraphractus	204
cognatus, Bombus	44
crabro, Vespa	319
cunicularia, Colletes	239
cyanescens, Xylocopa	239
derhamellus, Bombus	289
dispar, Anthophora	239
Doryctidae	158
flavus, Lasius	246
fuliginosus, Lasius	246, 247
gallica, Polistes	239
germanica, Vespa	319
hirsuta, Ammophila	239
Iphianlax	158
jonellus, Bombus	44
juvencus, Sirex	332
lapidarius, Bombus... ..	288
lapponicus, Bombus	44
latreillellus, Bombus	289
luctuosa, Melecta	239
maculata, Tenthredo	212
maura, Mutilla	239
Mymaridae	204
mystaceus, Gorytes	239

	PAGE
parietum, <i>Odynerus</i> ...	239
pratorum, <i>Bombus</i> ...	44
pyrenaicus, <i>Bombus</i> ...	44
pyrenaica, <i>Chalcidodoma</i> ...	239
quadrimaculata <i>var. humeralis</i> , <i>Cimbex</i> ...	239
rufa, <i>Formica</i> 129, 210, 246, 247	
rufa, <i>Vespa</i> ...	288
smithianus, <i>Bombus</i> ...	44
spinipes, <i>Odynerus</i> ...	239
sylvanum, <i>Bombus</i> ...	289
sylvestris, <i>Vespa</i> ...	259, 288
tricornis, <i>Osmia</i> ...	239
venustus, <i>Bombus</i> ...	289
violacea, <i>Xylocopa</i> ...	239
Vipio ...	158
vulgaris, <i>Vespa</i> ...	318

LEPIDOPTERA.

	PAGE
abbreviata, <i>Eupithecia</i> ...	155, 181, 183
abietaria, <i>Boarmia</i> 61, 62, 92, 296	
abjecta, <i>Hadena</i> ...	67, 90
Abraxas ...	305
abruptaria, <i>Hemerophila</i> 157, 177	
... 213, 236, 289	
absinthii, <i>Bucculatrix</i> ...	232
absinthivora, <i>Depressaria</i> ...	231
absynthiata, <i>Eupithecia</i> ...	239
acanthodactyla, <i>Amblyptilia</i> ...	264
aceris, <i>Apatela</i> ...	89
Acherontia ...	146
achilleae, <i>Zygaena</i> ...87, 167, 175, 229	
achine, <i>Pararge</i> ...	236
Acidaliidae ...	186
Acompsia= <i>Brachycrossata</i> ...	231
Acraea ...	71
acrita, <i>Acraea</i> ...	71
Acrobasis ...	330
actaea, <i>Satyrus</i> ...	52, 53, 82, 83
<i>ab. bryce</i> ...	53
actaeon, <i>Thymelicus</i> 92, 214, 274, 275	
acuminatana, <i>Dicrorhampha</i> ...	96
acuminatella, <i>Gelechia</i> ...	241
adaequata (blandiata), <i>Emmelesia</i> ... 17, 91, 174	
addendaria, <i>Oporabia</i> 186, 286,	
... 315, 316, 317	
Adelides ...	194, 196
adippe, <i>Argynnis</i> 26, 53, 81, 83,	
... 92, 116, 203, 256, 313	
<i>var. cleodoxa</i> ...	83
adjunctella, <i>Coleophora</i> ...	184
adusta, <i>Hadena</i> ... 18, 93, 238, 333	
adustata, <i>Ligdia</i> ...	22, 214
advena, <i>Aplecta</i> ...	21
advenaria, <i>Epione</i> ...	211
advenella, <i>Rhodophoea</i> ...	96
aegon, <i>Plebeius</i> 25, 26, 92, 203,	
... 239, 250, 294	
<i>var. corsica</i> ...	294
aemulana, <i>Catoptria</i> ...	240, 337
aenea, <i>Phytometra</i> , <i>vide viridaria</i> , P.	
aeneana, <i>Argyrolepis</i> ...	43
aerattella, <i>Asychna</i> ...	181
aerealis, <i>Botys</i> <i>var. opacalis</i>	15
aescularia, <i>Anisopteryx</i> ...	94
aethiops, <i>Erebia</i> 26, 53, 54, 82,	
... 83, 262, 263	
<i>ab. leucotaenia</i> ...	82
affinitata, <i>Emmelesia</i> ...	138
agathina, <i>Agrotis</i> 91, 96, 182,	
... 296, 327, 334	
Agdistis ...	292, 293
aglaia, <i>Argynnis</i> 26, 53, 83, 91,	
... 92, 116, 118, 203, 297, 313	
Aglaope ...	271
Aglia ...	197, 286
Agliadae ...	287
agrestis, <i>Agrotis</i> ...	99
Agrotis ...	19
albicollata, <i>Melanthia</i> ...	239
albicolon, <i>Mamestra</i> ...	18
albipuncta, <i>Leucania</i> 2, 42, 162,	
... 164, 297, 336	
albipunctata, <i>Eupithecia</i> ...	331, 334
<i>ab. angelicata</i> ...	331
albipunctella, <i>Depressaria</i> ...	43
albulalis, <i>Nola</i> ...	214, 274, 275
alcea, <i>Spilothyrus</i> 185, 221, 253, 303	
alchemillata, <i>Emmelesia</i> ...	138
alchimiella, <i>Gracilaria</i> ...	139
alchymista, <i>Catephia</i> ...	336
alciphron, <i>Chrysophanus</i> <i>var.</i> <i>gordius</i> ...	80, 303
alcon, <i>Polyommatus</i> ...	297
aleyone, <i>Hipparchia</i> ...	82
allantiformis, <i>Sesia</i> ...	336
allisella, <i>Exaereta</i> ...	43
alpestralis, <i>Heryna</i> ...	15
alpestris, <i>Agrotis</i> ...	229
alpicola, <i>Clisiocampa</i> ...	16
alpina, <i>Scoparia</i> (banded <i>ab.</i>) ...	41
alpinalis, <i>Botys</i> <i>var. uliginosalis</i> ...	15
alpinana (polltana), <i>Dicrorhampha</i> ... 43, 230	
alpinellus, <i>Crambus</i> 41, 230, 296	
alsines, <i>Caradrina</i> ...	93, 326
alternana, <i>Conchylis</i> ...	230
alternata, <i>Macaria</i> ...	92
althaea, <i>Spilothyrus</i> ...80, 83, 253	
Alucita ...	231
Alucitides ...	175
alveus, <i>Syrichthus</i> ...	202, 221, 253
amataria, <i>Timandra</i> ...	22, 90
amathusia, <i>Brenthis</i> ...	26
ambigua, <i>Caradrina</i> ...	2
ambigua, <i>Scoparia</i> ...	230
ampelophaga, <i>Ino</i> ...	271
Amphidasys ...	289
Amphidasys ...	289
ancilla, <i>Naclia</i> ...	141
anderidae, <i>Lithocolletis</i> ...	264

	PAGE		PAGE
anguinalis, Ennychia ...	102	atricapitana, Eupoeecilia ...	43
angularia-alniaria, Ennomos ...	42	atriplicis, Hadenia ...	125, 296
Anisopteryx ...	289	atropos, Acherontia 1, 23, 35, 42,	
Anisota ...	197	46, 48, 61, 64, 123, 154, 265,	
annulata, Zonosoma ...	22	266, 267	
anomala, Stilbia ...	91, 146, 180	augur, Graphiphora ...	93, 182
anthyllidella, Anacamptis ...	67, 231	aurago, Tiliacea (Xanthia) 19, 21,	
Anticlea ...	201	40, 60, 66, 130, 154, 294, 333, 334	
antiopa, Euuanessa 1, 20, 21, 53,		ab. fucata ...	294
64, 81, 82, 83, 135, 225, 250,		ab. virgata ...	294
252, 304, 336		aurantiaria, Hybernica ...	72, 210
antiqua, Orgyia ...	157, 327	aurelia, Melitaea ...	81
antiquana, Orthotaenia ...	17	var. britomartis ...	27, 290
Apatura ...	5	aurinia, Melitaea ...	183, 225, 238
apiciaria, Epione ...	23, 91	ab. artemis ...	225
apiforme, Trochilium ...	260	ab. brunnea ...	225
Apoda ...	198	ab. provincialis ...	225
apollo, Parnassius 26, 52, 53,		var. iberica ...	225
applanata, Depressaria ...	43	var. merope ...	27
81, 203, 223		auroraria, Hyria ...	84
approximaria, Oporabia 186, 248,		aurulentella, Argyresthia ...	96
286, 315, 317, 318		austriacalis, Botys ...	15, 230
aptata, Larentia ...	16, 229	Automeris ...	287
aqueata, Hydriomena (Larentia)		autumnalis, Hydriomena ...	201
84, 174, 229		ab. literata ...	201
arcania, Coenonympha ...	53	autumnaria, Ennomos ...	117, 327
arceuthata, Eupithecia ...	265	autumnaria, Oporabia 61, 185,	
archippus (erippus), Anosia 1, 5,		186, 248, 249, 283, 284, 285,	
99, 133, 135, 160, 200, 331		286, 315, 316, 317	
Arctiidae ...	197	avellanella, Epigraphia ...	94
Arctides ...	196	aversata, Acidalia 22, 138, 174,	
arenella, Depressaria ...	43	239, 295, 296, 298.	
areola, Xylocampa 94, 155, 182, 183		ab. spoliata ...	174
argentana, Aphelia (Sciaphila) 14,			
229, 230		badiata, Anticlea ...	17, 129, 182, 333
argiades, Everes ...	253, 254	baia, Noctua ...	22, 182
ab. polysperchon ...	254	baliodactyla, Acipitilia ...	175
argiolus, Cyaniris 22, 23, 92, 137,		ballus, Thestor ...	303
222, 250, 253, 303, 312		bankesiella, Epischia ...	19
argus, Plebeius (Polyommatus) 25,		barbalis, Pechypogon ...	210
203, 294		basilaris, Butalis ...	198
Argynnidi ...	5, 26, 297	basilinea, Apamea 70, 157, 238, 333	
arion, Lycaena 1, 25, 95, 101,		batis, Thyatira 91, 92, 213, 233,	
102, 103, 214, 250, 274, 275,		266, 333	
276, 332, 335		baton, Polyommatus 185, 222, 253,	
armigera, Heliothis ...	331	254, 303	
asella (cruciata), Heterogenea 58, 275		var. panoptes ...	254
assimilella, Depressaria ...	67	belgiaria, Scodionia ...	211, 327
associata (dotata), Cidaria ...	201	belia, Anthocharis ...	37, 94, 185,
astrache, Polyommatus 22, 42,		223, 250, 251, 304	
52, 80, 81, 90, 222, 250, 303,		var. ausonia ...	223, 225
312, 330		var. simplonia ...	223
var. quadripuncta ...	330	bellargus, Polyommatus 25, 42,	
atalanta, Pyrameis 62, 78, 79,		52, 80, 81, 91, 222, 250, 253,	
82, 83, 90, 157, 225, 250, 251,		269, 297, 331	
272, 298, 313		ab. cernus ...	297
athalia, Melitaea, 26, 214, 225, 274, 275		ab. niger ...	331
athamanthae, Zygaena ...	272	berberata, Anticlea ...	174
ab. peucedani ...	272	betulae, Zephyrus ...	5, 274, 297
atomalis, Scoparia ...	41	betularia, Amphidasys 65, 109,	
atomaria, Ematurga 70, 84, 91,		128, 289, 327	
93, 155, 173		ab. doubledayaria ...	65, 181
atmorella, Argyresthia ...	2	bicolora, Microdonta ...	41, 331
atrata (chaerophyllata), Tanagra		bicolorana (quercana), Hylophila	
15, 210, 229, 297		48, 296	

	PAGE		PAGE
bicolorata, <i>Melanthia</i> ...	201, 295, 298	<i>ab. pallida</i> ...	38
<i>ab. fumosa</i> ...	201	<i>ab. pallidior (hutchinsoni)</i> ...	38, 53
<i>ab. parvula</i> ...	201	caledoniana, <i>Peronea</i> ...	327
<i>ab. plumbata</i> ...	201	caliginosa, <i>Acosmetia</i> ...	214, 275
bicoloria, <i>Miana</i> ...	39, 298	callidice, <i>Pieris</i> ...	27, 290
<i>ab. rufuncula</i> ...	39	calthella, <i>Eriocephala</i> ...	2
bicuspis, <i>Cerura</i> ...	2, 65, 269, 336	cambrica, <i>Venusia</i> ...	247, 327
bifida, <i>Cerura</i> ...	65	camelina, <i>Lophopteryx</i> ...	22, 42, 295
bilineata, <i>Campptogramma</i> ...	84, 157, 173	camilla, <i>Limnitis</i> ...	25, 53, 82, 304
bilunana, <i>Paedisca</i> ...	67	campestris, <i>Agrotis</i> ...	99
bilunaria, <i>Selenia</i> ...	188	cana, <i>Catoptria</i> ...	91
binaria, <i>Drepana</i> ...	22, 137, 140, 335	candelarum, <i>Agrotis</i> ...	
bipunctaria, <i>Ortholitha (Eubolia)</i> ...	54, 84, 173, 229	<i>var. ashworthii</i> ...	96
bisetata, <i>Acidalia</i> ...	298	candida, <i>Erydia</i> ...	140, 141
Biston ...	289, 290	candidata, <i>Asthena</i> ...	84, 239
bistortata (<i>crepuscularia</i>), <i>Tephrosia</i> ...		caniola, <i>Lithosia</i> ...	141
2, 6, 7, 8, 9, 22, 28, 29, 30,		capitella, <i>Incurvaria</i> ...	67
31, 32, 42, 46, 47, 55, 56, 57,		capreana, <i>Penthina</i> ...	120
64, 92, 93, 107, 108, 109, 118,		capsincola, <i>Dianthoecia</i> ...	22, 209, 298
119, 124, 127, 128, 130, 138,		capsophila, <i>Dianthoecia</i> ...	46, 140,
142, 143, 144, 149, 150, 155,		142, 152, 209	
157, 171, 172, 183, 185, 205,		captiuncula, <i>Phothedes</i> ...	46, 328
215, 216, 217, 243, 245, 258,		cardamines, <i>Euchloe</i> ...	5, 182, 185,
259, 277, 278, 279, 319, 320,		210, 224, 253, 255, 279, 295,	
323, 324, 328		304, 312, 329	
<i>ab. passettii</i> ...	171	<i>ab. major</i> ...	224
<i>var. abietaria</i> ...	6, 29, 143	<i>ab. turcitis</i> ...	224
blomeri, <i>Asthena</i> ...	334	carduella, <i>Depressaria</i> ...	48
Boarmiidae ...	229, 289	cardui, <i>Pyrameis</i> ...	5, 53, 62, 82,
Bourmiinae ...	289	83, 90, 91, 157, 225, 250, 251,	
boetica, <i>Lampides</i> ...	95, 250	268, 273, 298, 331, 333	
bolina, <i>Hypolimnas</i> ...	276	<i>ab. minor</i> ...	331
Bombyces ...	196	carmelita, <i>Lophopteryx</i> ...	154, 155, 275
Bombycidae ...	197	carnella, <i>Ilythia</i> ...	84, 175
Bombycides ...	16, 54	carniolica, <i>Zygaena</i> ...	55, 84, 87, 175
bombyliformis, <i>Macroglossa</i> ...	183,	carpinata (lobulata), <i>Lobophora</i> ...	
210, 266		155, 182, 183, 247, 259	
Bombyx ...	62	carpophaga, <i>Dianthoecia</i> ...	152, 240, 334
boreata, <i>Cheimatobia</i> ...	248	casta, <i>Doratifera</i> ...	198
bractea, <i>Plusia</i> ...	2, 17, 19, 54, 270	castanea, <i>Noctua</i> ...	182, 298, 334
branderiana, <i>Tortrix</i> ...	96	<i>ab. neglecta</i> ...	334
brassicae, <i>Mamestra</i> ...	93, 157, 298, 333	castaneae (arundinis), <i>Macrogaster</i> ...	296
brassicae, <i>Pieris</i> ...	83, 94, 157, 213,	castrensis, <i>Olisicampa</i> ...	68, 69, 90,
223, 255, 282, 303, 312		184, 214, 274, 275	
brogniardellum, <i>Coriscium</i> ...	43	Catocala ...	328
brunata, <i>Cheimatobia</i> ...	93, 94, 283	cecropia, <i>Samia</i> ...	135, 161
brunnea, <i>Noctua</i> ...	18, 266, 334	celerio, <i>Choerocampa</i> ...	332, 336
brunnealis, <i>Cleodobia (Actinia)</i> ...	175	cembrae, <i>Scoparia</i> ...	179
bucephala, <i>Phalera</i> ...	18, 91, 235, 298	centaureata, <i>Eupithecia</i> ...	vide oblon-
budensis, <i>Ino</i> ...	271	gata, E.	
caesia, <i>Dianthoecia</i> ...	152, 209	centonalis, <i>Nola</i> ...	214, 274, 275, 336
caesiata, <i>Larentia</i> ...	18, 91, 247, 327	<i>Cerura</i> ...	218
cagnagellus, <i>Hyponomeuta</i> ...	175	cespitalis, <i>Herbula</i> ...	84
cala, <i>Arctia</i> ...	18, 38, 41, 93, 157,	cespitana, <i>Sericoris</i> ...	175, 230
192, 212, 336		cespitis, <i>Luperina</i> ...	66
<i>ab. flavescens</i> ...	157	ceto, <i>Melampus</i> ...	26
c-album, <i>Polygonia</i> ...	5, 25, 38, 53,	chaeribula, <i>Acraea</i> ...	71
83, 225, 253, 274, 275, 281		chaerophyllella, <i>Depressaria</i> ...	43
<i>ab. fusca</i> ...	38	chalcogrammella, <i>Coleophora</i> ...	120
<i>ab. hutchinsoni</i> ...	38, 53	chaonia, <i>Notodonta</i> ...	67, 154, 295
<i>ab. laceratis</i> ...	38	charon, <i>Zygaena</i> ...	168, 169
<i>ab. lutescens</i> ...	38	<i>Cheimatobia</i> ...	247
<i>ab. minor</i> ...	38	Cheloniides ...	16, 54, 84, 93, 141,
		157, 230	
		Chelopteryx ...	197

	PAGE		PAGE
chi, Polia	18, 298	<i>ab. ochrea</i>	72
chlorana, Earias	208	conspersana, Sciaphila	153
chloros, Ino	271	conspicillaris, Xylomiges	2
chrysidiformis, Sesia	274	conspicua, Fidonia, <i>vide</i> limbaria,	
chrysitis, Plusia	22, 91	F.	
chrysocephala, Ino	271	contaminana, Teras	84
Chrysocorys	3	contigua, Hadenia	333
chryson (orichalcea), Plusia	214, 275	convolvuli, Sphinx 1, 23, 44, 228,	
Chrysophanidi	5	265, 267, 269, 273, 333	
chrysorrhoea, Porthesia 91, 152,		coprodactylus, Stenoptilia (Mimae-	
185, 213, 214, 274, 275, 337		seoptilus) 14, 54, 231	
chrysozona (dysodea), Hecatera ...	181	coracina, Psodos	15
Cidaria	84, 247	cordula, Satyrus	203
ciliaria, Eupoecilia	181	<i>ab. bryce</i>	203
ciliella, Depressaria	43	coronata, Eupithecia	139
cinetalis, Spilodes	84, 175	corticana, Penthina	175
cinctaria, Boarmia	155	corticea, Agrotis	266, 297
cinerea, Agrotis	154	corydon, Polyommatus 25, 52, 80	
cingularis, Ennychia 19, 102, 175		81, 83, 91, 202, 250, 262, 270,	
cinxia, Melitaea 83, 185, 214, 225		294, 303, 311, 331	
253, 274, 281, 304		<i>ab. aurantia</i>	312
circellaris, Mellinia	70, 93, 334	<i>ab. caeruleo-marginata</i> 80, 312	
<i>ab. ferruginea</i>	70	<i>ab. marginata</i>	80, 312
<i>ab. macilenta</i>	70	<i>ab. minor</i>	331
circellata, Acidalia	42, 336	<i>ab. striata</i>	80
cirsiana, Ephippiphora	91	<i>var. hispana</i>	312
Citheroniidae	197	corylata, Cidaria	157, 210, 239
clandestina, Agrotis	99	coryli, Demas	97, 183, 240, 295
clathrata, Srenia	16, 22, 42,	cosmophorana, Coceyx	2
54, 84, 173, 229		Cossidae	137, 198
cleopatra, Gonepteryx 37, 95, 185,		Cossides	194, 196
205, 224, 225, 253, 280, 303, 329		Cossus	32, 84, 115
cloacella, Tinea	120, 330	costaestrigalis, Hyphenodes ...	93
c-nigrum, Noctua 22, 46, 93, 266, 333		crabroniforme, Trochilium ...	48
Cochliopodides	196	Crambides 15, 54, 93, 174, 196, 230	
cochylidella, Tinea	119, 330	Crambus	126
Coenonympha	36	crataegi, Aporia 1, 25, 28, 37, 83,	
Coenonymphi	36	122, 123, 214, 223, 267, 275, 303	
coenosa, Laelia	41, 125, 275, 336	crataegi, Trichiura	18, 327
cognataria, Amphidasys	289	crepuscularia (biundularia), Tephrosia	
cognatellus, Hyponomeuta	231	2, 6, 7, 8, 9, 28, 29, 30, 31,	
Coleophora	140	32, 46, 47, 55, 56, 57, 64, 93,	
Coleophorides	196	107, 108, 109, 124, 127, 128,	
Colias	53, 256	142, 143, 144, 149, 150, 155,	
colquhounana, Sciaphila	2	171, 182, 183, 185, 205, 213,	
comitata, Pelurga	157, 173, 297	215, 216, 217, 243, 258, 259,	
comma, Leucania 65, 157, 238,		268, 277, 278, 319, 320, 322,	
266, 333		323, 328	
comma, Pamphila 26, 80, 83, 202,		<i>ab. consonaria</i> (synonym) 8,	
270, 311, 334		29, 143	
comparia, Acidalia	229	<i>ab. delamerensis</i> 109, 143,	
complana, Lithosia 54, 65, 84,		149, 171, 172, 243, 277, 278,	
90, 92, 141		319, 320, 323, 324, 328	
<i>ab. pallida</i>	141	<i>ab. strigularia</i>	8
conchellus, Crambus	15	cribralis, Herminia	90
concolor, Tapinostola	124	cribrum, Emydia 119, 140, 141,	
concombens, Catocala	69	214, 275	
confusa, Noctua	66	<i>ab. candida</i>	140, 141
conformis, Xylina	42, 336	Cricula	197
conigera, Leucania	157	crinalis, Hypena	142
consignata, Eupithecia	46	cristana, Peronea	180
consonaria, Boarmia	183	cristatella, Bucculatrix	120
consortana, Dicrorhampha	96	croceago, Hoporina	165
consortaria, Boarmia	213, 296	cruciata (asella), Heterogenea ...	275
conspersa, Dianthoeia 19, 72, 152		cruciferarum, Plutella	205
		cucubali, Dianthoeia	22, 65

	PAGE
cuculata (sinuata), Anticlea ...	181
cuculipennellum, Coriscium ...	43
cucullatella, Nola ...	213
culmellus, Crambus 15, 16, 54,	
94, 174, 229, 230	
ab. obscura ...	230
cultraria (unguicula), Drepana 22,	
42, 140, 183	
cuneatella, Lita ...	36
cuprea, Noctua ...	229
cuprealis, Aglossa ...	91, 180
cursoria, Agrotis ...	30
cyanata, Larentia ...	174
cyllarus, Nomiades 222, 253, 303	
cynipiformis, Sesia ...	334
cynthia, Melitaea ...	27, 203
cynthia, Philosamia ...	161
dahlia, Noctua ... 19, 66, 91, 327	
damon, Polymommatus 25, 26, 52,	
80, 81, 83, 202, 203	
Danaid ...	5
daphne, Argynnis ...	81
daphnice, Pieris 5, 37, 185, 223,	
253, 255, 270, 304	
var. bellidice 37, 223, 255, 304	
debiliata, Eupithecia ...	207
decolorana, Catoptria ...	240, 337
decolorata, Emmelesia 138, 208, 238	
decolorella, Laverna ...	43
decrepitalis, Scopula ...	17
defoliaria, Hybernia 48, 63, 72,	
128, 210, 268	
degeerella, Adela ...	214
delius, Parnassius ...	27
delphinii, Chariclea ...	42
Deltoides ...	142, 230
denotata, Eupithecia, vide pimpi-	
nellata, E. ...	209
dentalis, Odontia ...	230
dentina, Hadenia ...	93
deplana, Lithosia ... 20, 62, 275	
depressella, Depressaria ...	208
depuncta, Noctua ...	66
derasa, Gonophora ...	266
derasana, Phoxopteryx ... 181, 240	
derivialis, Herminia ...	40
designata (propugnata), Coremia	
17, 22, 111, 139	
dia, Brenthis 26, 53, 81, 185, 225,	
253, 281	
Dicranura ...	115
dictaea, Leiocampa ...	295
dictaeoides, Leiocampa ... 65, 327	
dictynna, Melitaea ... 82, 83	
didyma, Apamea ... 54, 93, 157, 298	
ab. oculatea-flavo ...	54
didyma, Melitaea 26, 53, 82, 83, 304	
var. alpina ...	26
didymata, Larentia 247, 295, 296,	
298, 333	
dilucidaria, Gnophos	
var. mendicaria ...	174
diluta, Asphalia ...	334
dilutaria (holosericata), Acidalia 186, 237	

	PAGE
dilutata, Oporabia, vide nebulata, O.	
dilutella, Phycis ...	19
dipsaceus, Heliothis 93, 142, 267	
disippus, Limenitis ...	99
dissimilis (suasa), Hadenia ...	268
ab. w-latinum ...	142
dispar, Chrysophanus 42, 184, 336	
dispar, Porthetria 21, 54, 90, 142, 337	
distentella, Lithocolletis ...	269
distinctella, Gelechia ...	19
ditrapezium, Noctua ...	20
dodoneata, Eupithecia ...	295
dolobraria, Eurymene 62, 214, 295	
dolosellus, Megacraspedus ...	140
dominula, Callimorpha ...	153, 154
donzelii, Polyommatus ...	27, 297
dorilis, Chrysophanus ... 80, 83, 221	
dorylas, Polyommatus ...	26
doubledayana, Sericoris ...	181
dryas, Enodia ...	263
dubia, Zygaena ... 168, 169, 170	
dumetellus, Crambus ...	238
dumerilii, Luperina ...	336
duplaris, Cymatophora ...	19, 238
duponcheli, Leucophasia ...	206, 224
Echidnae ...	287
edusa, Colias 3, 26, 36, 37, 52, 53,	
62, 81, 83, 92, 185, 203, 224,	
253, 256, 267, 268, 273, 280,	
304, 331	
ab. ♀ obsoleta ...	331
ab. suffusa ...	331
egea, Polygonia 95, 147, 178, 185,	
225, 253, 281	
egeria, Pararge 25, 37, 88, 92, 94,	
184, 185, 210, 226, 250, 252,	
253, 304, 314	
ab. intermedia ...	314
var. egerides ...	314
var. meone ...	226
Elachista ...	65, 126
elpenor, Choerocampa 65, 66, 209,	
237, 268, 288	
elutella, Ephestia ...	230
emarginata, Acidalia ...	92
emberizaepenella, Lithocolletis ...	62
Endromides ...	196
Endromis ...	3, 197
Ennomidae ...	289
Ennominae ...	289
Ennomos ...	186, 328
Epermenia ...	3
ephemeraeformis, Thyridopteryx 24	
epialtes, Zygaena ...	272
epilobiella, Laverna ...	180
Epinephela ...	36
epiphron, Melampus ... 91, 261	
var. nelamus ...	26
Epiplemidæ ...	158
Epirrita ...	247
epistygne, Erebia 185, 221, 226,	
253, 281, 282, 337	
Erebia ...	26, 226, 281, 290
Erebiidi ...	27

	PAGE		PAGE
ericellus, Crambus ...	91	<i>ab. melana</i> ...	284
ericetaria (plumaria), Selidosema	173	<i>ab. virgata</i> ...	284
Eriocephala ...	59	filipendulae, Zygaena	69, 70, 84,
Eriocephalidae ...	195	87, 88, 99, 103, 104, 105, 106,	
Eriocephalides ...	194, 196	109, 166, 168, 169, 170, 176,	
eros, Polyommatus	27, 203, 297	261, 272, 273	
erosaria, Ennomos ...	91, 327	<i>ab. cerinus</i> ...	336
escheri, Polyommatus	52, 80, 202, 303	fimbria, Triphaena	93, 157, 182,
Euchlœe ...	5	290, 298, 327, 328	
Eugonia ...	186, 213	firmata, Thera ...	240
euphenoides, Euchlœe	185, 253,	flavago, Citria ...	18, 240, 298
255, 279, 304, 329		flavalis, Botys ...	175, 230
euphorbiae, Deilephila	228, 288,	<i>ab. lutealis</i> ...	175
293, 336		flaveolaria, Acidalia ...	16, 229
euphorbiana, Sericoris ...	241	flavicincta, Polia ...	333
euphrosyne, Brenthis	26, 219,	flavicinctata, Larentia ...	174
225, 304, 313		flavicornis, Asphalia	92, 94, 129, 183
Eupithecia	174, 186, 325, 331, 334	flavimaculella, Oecophora	209
euryale, Erebia ...	82, 203	flexula, Aventia ...	20, 62, 93, 138
<i>ab. adyte</i> ...	203	fluctuata, Melanippe	3, 22, 93,
Eurymus ...	256	111, 157, 173, 186, 333	
evias, Erebia ...	226, 281	fluctuosa, Cymatophora ...	91, 214
evonymellus, Hyponomeuta	231	fluviata, Campptogramma ...	264
exanthemaria, Cabera ...	333	foeneana, Ephippiphora ...	42
exclamationis, Agrotis	17, 157,	formosa, Pempelia ...	181
263, 296, 332, 333		formosella, Oecophora ...	94, 336
<i>ab. picea</i> ...	332	francillana, Conchylis ...	43
exiguata, Eupithecia ...	239	fraternella, Gelechia ...	36, 71
exoleta, Calocampa ...	93, 333	fraxinata, Eupithecia ...	265
exoletellus, Megacraspedus ...	140	fraxini, Catocala ...	42, 69, 147, 213
expallidata, Eupithecia ...	334	FRENATE ...	136, 194, 195, 242
extersaria, Tephrosia ...	20, 62	fritillum, Syrichtus ...	26
extranea, Leucania ...	267	fuciformis, Macroglossa ...	211, 214
exulans, Zygaena	13, 87, 88,	fuliginaria, Boletobia ...	336
214, 275, 328		fuliginosa, Spilosoma ...	18
<i>ab. clara</i> ...	13	<i>var. borealis</i> ...	93
<i>ab. flavilinea</i> ...	13, 14	fulva, Tapinostola ...	18, 298
<i>ab. pallida</i> ...	14	fulvago, Citria ...	18, 240, 298
<i>ab. striata</i> ...	14	<i>ab. flavescens</i> ...	229
<i>ab. vanadis</i> = <i>ab. subochracea</i>	13	fulvata, Cidaria	229, 240, 295, 298
fagi, Stauropus	22, 40, 183, 207, 265	fumata, Acidalia ...	91, 298, 327
<i>ab. obscura</i> ...	40, 208, 265	furcata, Hydriomena=sordidata, H.	
<i>ab. virgata</i> ...	208	18, 70, 84, 85, 86, 93, 110,	
falcetaria (falcule), Drepana	22,	111, 240, 298, 333, 335	
137, 140, 211, 240		<i>ab. infuscata</i> ...	85, 86, 110
fallacella, Butalis ...	14	<i>var. albifasciata</i> ...	85, 86
falsellus, Crambus ...	54	<i>var. fusco-undata</i> ...	85, 86, 110
farinalis, Pyralis ...	180	<i>var. nubo-fasciata</i> ...	85
farreni, Cataplectica ...	65	<i>var. oblitterata</i> ...	86
fascelina, Dasychira ...	18	<i>var. sordidata</i> ...	86
fasciana, Erastria ...	91, 93, 211	<i>var. testacea</i> ...	86
fasciata, Cirrhochoera ...	276	furcatellus, Crambus ...	15
fasciuncula, Miana ...	17, 91, 93, 239	furcula, Cerura ...	43, 177, 298
favicolor, Leucania ...	2	furva, Dryobota (Mamestra)	19,
fenestrella, Endrosis ...	324	66, 91, 93	
ferrugana, Peronea ...	94	furvata, Gnophos ...	38
ferrugata, Coremia	54, 139, 174, 213	fusca (carbonariella), Pempelia	
festiva, Noctua	66, 238, 333, 334	(Phycis) ...	15, 17
festucae, Plusia ...	18, 40, 118	fusca, Pygmaena ...	16, 229
Fidoniidae ...	229, 289	fuscalis, Botys ...	84
Fidoniinae ...	289	fuscocuprella, Coleophora ...	241
filigrammaria, Oporabia	61, 125,	galatea, Melanargia	26, 28, 82,
185, 186, 248, 249, 282, 283,		84, 90, 91, 92, 160, 203	
284, 285, 286, 315, 316, 317, 318		galiata, Melanippe	22, 111, 139, 213

	PAGE
galii, Deilephila	267, 273, 288, 335, 336
Galleridae	330
gallicolana, Ephippiphora	264
gamma, Plusia	93, 157, 298
gei, Nepticula	2
Gelechia	36, 71
Gelechiidae	140
Gelechiidae	36, 198
Gelechiides	14, 54
gemina, Apamea	17, 18, 91, 93, 238
var. remissa	93
geminana, Grapholitha	327
geminipuncta, Nonagria	152
gemma, Boarmia	138, 157, 174
genistae, Hadena	210, 239, 334
Geometridae	229, 243, 256
Geometrides	15, 19, 54, 67, 84, 93, 157, 173, 196, 228
gerningana, Amphisa	18, 327
geryon, Procris	13
var. chrysocephala	13
gilvago, Mellina	66, 333, 334
gilvaria, Aspilates	16, 84, 173
glabraria, Cleora	62, 92, 296
glacialis, Erebia	27, 290
var. pluto	290
glareosa, Noctua	91, 93, 298, 327
glauca, Hadenia	18, 327
glaucata (spinula), Ciliix	22
glaucinalis, Pyralis	84
glitzella, Coleophora	2
glyphica, Euclidia	16, 84, 238, 291
gnaphalii, Cucullia	42, 180, 336
gnomana, Dichelia	175, 230
goante, Erebia	26, 82
Gonepteryx	256
gonodactyla, Platyptilia	14, 17, 45, 232
gonostigma, Orgyia	22, 69, 100
gorge, Erebia	26
gothica, Taeniacampa	17, 93, 129, 155, 182, 209, 333
ab. variegata	182
gracilis, Taeniacampa	155, 183
graminis, Charneae	66, 229, 297
grammica, Eulepia	336
grandipennis, Butalis	43
griseata, Lithostege	214, 267, 275
grossana, Carpocapsa	240
grossulariata, Abraxas	41, 42, 46
(abs.), 61, 157, 207, 214, 236, 336	
ab. variegata	46
guenei, Luperina	336
gysselinella, Cedestis	2, 129
halterata, Lobophora	239
hamula, Drepana	22
harpagula (sicula), Drepana	41, 214, 240, 275, 336
hastata, Melanippe	243
hastiana, Peronea	208
haworthii, Celaena	18, 91, 296, 327
hellmanni, Tapinostola	208
helveticata, Pupithesia	18
helvola (rufina), Anchocelis	19, 298

	PAGE
Hemileuca	286, 287
Hemileucidae	197
hepatica, Xylophasia	65, 332, 333
var. charactera	332
Hepialidae	195
Hepialides	55, 94, 157, 194, 195, 196, 242, 303
Hepialus	137
hera, Callimorpha	54, 84, 141, 157
ab. lutescens	54, 141
ab. saturnina	54, 141
Heraea	287
heraciella, Depressaria	43
herbariata, Acidalia	336
herbida, Aplecta, vide prasina, A.	
herbosana, Dicrorhampha	17, 327
hermanella, Gelechia	208
hermione, Hipparchia	26, 53, 82, 83, 203
Hesperidae	242, 303, 311
Hesperides	80, 83, 196, 202, 221, 311
Hesperidi	80, 202
heterodactylus (teucii), Oxyptilus	72
var. celusii	72
Heterogenea	198
hexadactyla, Alucita (Orneodes)	3, 43, 175
heydenreichii, Procris	13
hiera, Pararge	297
hieracii, Oxyptilus	126, 231
hilaris, Zygaena	272
hippocastanaria, Pachycnemis	92, 155
hippocrepidis, Zygaena	87, 88, 103, 104, 106, 166, 169
hippotoë, Chrysophanus	
var. eurybia	27, 202
hispidaria, Nyssia	94, 155, 182, 183, 210, 289
hispidus, Heliophobus	179
hirtaria, Biston	157, 289, 290, 327
hochenwarthi, Plusia	16
holosericata, Acidalia, vide dilu-	
taria, A.	
hostilis, Nephopteryx	269
humeralis, Gelechia	43
humiliata, Acidalia	174, 229, 237
humuli, Hepialus	94, 157
hyale, Colias	26, 52, 53, 81, 83, 91, 185, 203, 224, 253, 256, 273, 280, 331
ab. apicata	81
ab. intermedia	52, 81
ab. pallida	331
Hybernia	289
Hydriomena	84, 86
hyemana, Tortricodes	94
hylas, Polyommatus	222, 254
hyperanthus, Enodia	5, 38, 207, 263, 297, 314, 332, 333
ab. caeca	332
ab. obsoleta	333
hyperborea, Pachnobia	152
var. alpina	2
Hyperchiria	287
hypericana, Catoptria	14

	PAGE		PAGE
<i>Hypsipetes</i>	84	<i>Junonia</i>	5
<i>hyrciniana</i> , <i>Coceyx</i>	67	<i>kollari</i> , <i>Oxyptilus</i>	14
<i>ianira</i> , <i>Epinephele</i> 37, 53, 82, 92,		<i>lacterinaria</i> , <i>Drepana</i>	91
304, 314		<i>lactearia</i> , <i>Iodis</i>	210
<i>ab. grisea</i>	82	<i>laeta</i> , <i>Zygaena</i>	272
<i>ab. hispulla</i>	82, 304	<i>laisidis</i> , <i>Elymnias</i>	276
<i>ab. pallens</i>	82	<i>lanestris</i> , <i>Eriogaster</i>	214
<i>ab. suffusa</i>	314	<i>lantoscanus</i> , <i>Oxyptilus</i>	231
<i>icarus</i> , <i>Polyommatus</i> 18, 52, 80,		<i>lapidata</i> , <i>Phibalapteryx</i>	18
83, 203, 214, 222, 250, 253,		<i>lappella</i> , <i>Parasia</i>	67
270, 297, 303, 312, 331, 336		<i>lappona</i> , <i>Erebica</i>	27
<i>ab. caerulea</i>	312	<i>laponaria</i> , <i>Nyssia</i>	126
<i>ab. caerulea-cuneata</i>	312	<i>Larentiidae</i> 84, 110, 200, 229	
<i>ab. celina</i>	312	<i>laricaria</i> , <i>Tephrosia</i>	259
<i>ab. clara</i>	80	<i>laricella</i> , <i>Coleophora</i>	67
<i>ab. icarinus</i> 52, 80, 222, 303, 312		<i>lariciata</i> , <i>Eupithecia</i>	239
<i>ab. iphis</i>	80, 312	<i>Lasiocampidae</i>	197
<i>var. rufina</i>	331	<i>Lasiocampides</i> 84, 93, 141, 196	
<i>ida</i> , <i>Epinephele</i>	36	<i>lateritia</i> , <i>Apamea</i>	142
<i>ilia</i> , <i>Apatura</i>	335	<i>lathonia</i> , <i>Argynnis</i> 53, 81, 83, 203,	
<i>ilicifolia</i> , <i>Gastropacha</i>	2, 41, 336	225, 226, 253, 281	
<i>illuminatella</i> , <i>Argyresthia</i>	2	<i>lavandulae</i> , <i>Zygaena</i>	272, 304
<i>imitaria</i> , <i>Acidalia</i>	22, 138	<i>lavaterae</i> , <i>Spilotheus</i>	26
<i>immanata</i> , <i>Cidaria</i>	31, 156, 298	<i>leda</i> , <i>Melanitis</i>	35, 71
<i>immorata</i> , <i>Acidalia</i> (<i>Strenia</i>) 16, 84, 173		<i>leioptilus</i>	72
<i>impudens</i> , <i>Leucania</i>	268	<i>lemnata</i> , <i>Cataclysta</i>	239
<i>impura</i> , <i>Leucania</i>	91, 157, 186	<i>Lemonia</i>	197
<i>impurata</i> , <i>Eupithecia</i>	54, 174	<i>Lemoniidae</i>	5, 222, 242
<i>incarnatana</i> , <i>Penthina</i>	230	LEPIDOPTERA-HAUSTELLATA	196
<i>incerta</i> , <i>Taeniocampa</i> 18, 129,		LEPIDOPTERA-LACINIATA	196
155, 182, 183, 209, 268, 333		<i>leplastriana</i> , <i>Stigmonota</i>	67
<i>ab. fuscata</i>	182	<i>leporina</i> , <i>Acronycta</i> 19, 62, 92,	
<i>ab. instabilis</i>	333	194, 238, 268, 333	
INCOMPLETE	13, 194, 195	<i>Leucinodes</i>	151
<i>inconspicua</i> , <i>Solenobia</i>	2	<i>leucographa</i> , <i>Pachnobia</i>	268
<i>indigata</i> , <i>Eupithecia</i>	239	<i>leucophaea</i> , <i>Hybernia</i>	94, 183
<i>infidaria</i> , <i>Larentia</i>	174	<i>Leucophasia</i>	5, 224
<i>infrequens</i> , <i>Macytha</i>	198	<i>lewini</i> , <i>Doratifera</i>	198
<i>Ino</i>	271, 273	<i>libatrix</i> , <i>Gonoptera</i>	84, 298
<i>inornata</i> , <i>Acidalia</i> 22, 92, 213, 326		<i>Libytheidae</i>	242
<i>inquinatellus</i> , <i>Crambus</i>	174	<i>lichenaria</i> , <i>Cleora</i> ... 22, 62, 138,	
<i>insignata</i> , <i>Agrotis</i>	99	260, 296	
<i>instabiliella</i> , <i>Lita</i>	184	<i>lichea</i> , <i>Erebica</i>	179
<i>interjectaria</i> , <i>Acidalia</i>	186, 295	<i>ligea</i> , <i>Erebica</i>	82
<i>intermediella</i> , <i>Lita</i>	71	<i>ligniperda</i> , <i>Cossus</i>	20, 266
<i>interrogationis</i> , <i>Plusia</i> 18, 65, 91		<i>ligula</i> , <i>Orrhodia</i>	19
<i>introferus</i> , <i>Agrotis</i>	99	<i>ligustri</i> , <i>Craniophora</i> 43, 65, 148,	
<i>io</i> , <i>Vanessa</i> 53, 82, 83, 90, 205, 225,		181, 334	
313, 327		<i>ligustri</i> , <i>Sphinx</i>	92, 293, 300
<i>iolas</i> , <i>Polyommatus</i>	40	<i>limacodes</i> (<i>testudo</i>), <i>Apoda</i>	58, 69
<i>iota</i> , <i>Plusia</i>	91, 266	<i>Limacodidae</i>	137, 198
<i>iphis</i> , <i>Coenonympha</i>	203	<i>limbalis</i> , <i>Orobena</i>	54
<i>var. dauphinae</i>	203	<i>limbaria</i> (<i>conspicua</i>), <i>Fidonia</i>	
<i>iris</i> , <i>Apatura</i> 26, 62, 92, 192, 214,		176, 214, 275	
274, 275, 296		<i>limitata</i> , <i>Ortholitha</i>	229, 298
<i>irregularis</i> , <i>Dianthoecia</i> 214, 267, 275		<i>Limnadiidae</i>	242
<i>irrorella</i> , <i>Setina</i>	16, 41, 54, 209	<i>limoniella</i> , <i>Goniodoma</i>	43
<i>ab. andereggii</i>	16	<i>limosipennella</i> , <i>Coleophora</i>	209
<i>ismene</i> , <i>Melanitis</i>	35	<i>linearia</i> , <i>Zonosoma</i>	138
<i>jasius</i> , <i>Charaxes</i> 37, 185, 192, 217		<i>lineata</i> (<i>dealbata</i>), <i>Scoria</i>	214, 275
JUGATAE	137, 194, 195, 242	<i>lineola</i> , <i>Thymelicus</i> 90, 202, 274	
<i>juliana</i> , <i>Carpocapsa</i>	240	<i>Liparidae</i>	197
<i>juncicolella</i> , <i>Coleophora</i>	67	<i>Liparides</i>	142, 196, 230

	PAGE		PAGE
Liparis	113	maculata, Venilia	42
Lita	36	ab. quadrimaculata	42
literosa, Miana	19, 296, 297	madagascercensis, Chrysidia	157
lithargyria, Leucania	182	maera, Pararge 26, 79, 82, 83, 260	
Lithocolletis	61, 126	ab. obscura	260
Lithosiidae	197	malvae (alveolus), Syrichthus 65,	
lithoxylea, Xylophasia	65, 157, 266	160, 221, 253, 311, 332	
littoralis, Leucania	137, 264	ab. taras	332
littorella, Gelechia	336	malvarum, Spilothyrus	253
litura, Anchocelis	18, 298	var. australis	253
litrata, Macaria 138, 238, 240, 327		margaritaria, Metrocampa 84, 173	
livornica, Dellephila	1, 336	marginata, Catastia	15
lixella, Coleophora	232	ab. auriciliella	15
loeflingiana, Dictyopteryx	139	marginipunctata (promutata), Aci-	
longipalpis, Leucinodes	151	dalia 16, 22, 54, 90, 91, 128,	
loniceræ, Zygaena 69, 87, 88, 98,		174, 213	
105, 109, 166, 167, 168, 169,		marginaria, Hybernia 94, 183, 210, 333	
171, 229, 271, 272, 273,		marginata, Lomaspilis	84, 333
336 (white ab.)		marginellus, Oxyptilus	231
loniceræ-trifolii, Zygaena	167	maritima, Senta	118
lota, Orthosia	19, 70	ab. bipunctata	118
ab. rufa	19, 70	ab. nigrostriata	118
lotella, Anerastia	175	ab. wisnariensis	118
lubricipeda, Spilosoma 46, 47, 157, 298		maritima, Argyrolepia	241
ab. deschancei	47	matura (cytherea), Cerigo 65, 268, 326	
ab. fasciata	47	maura, Mania	91
var. zatima	47	medesicaste, Thais 185, 223, 253,	
lucens, Hydroecia	91	254, 255, 303	
lucerna, Agrotis	19, 66	ab. honoratii	223
luciana, Catocala	69	medicaginis, Zygaena 69, 87, 166,	
lucida, Acontia	304	167, 168, 169, 170, 171	
lucina, Nemeobius	5, 222, 336	medusa, Zygaena	272
lucipara, Euplexia	18	megacephala, Pharetra	157, 333
luctuosa, Acontia	42, 291, 304	Megacrasspedus	140
lunaria, Selenia	22, 140	megaera, Pararge 79, 82, 83, 184,	
lunaris, Ophiodes	42	185, 226, 250, 252, 270, 298,	
lunigera, Agrotis	19	304, 313	
lunosa, Anchocelis	298	Megalopygidae	198
lupulinus, Hepialus	72, 157	melampus, Melampias	26
lurideola, Lithosia	54, 141	Melanargia	237
lutarella (pygmaeola), Lithosia 54,		Melanippe	186, 201
140, 141, 229, 230, 296		melanops, Nomiades 185, 222, 253, 303	
var. pygmaeola 54, 140, 141, 296		melilotella, Coleophora	209
lutengo, Dianthocia	146, 336	meliloti, Zygaena 87, 88, 214, 272,	
var. barrettii	16, 229	273, 275	
lutearia, Cleogene	239, 240	menthastri, Spilosoma 84, 157, 298	
luteata, Asthena	22	ab. walkeri	41
luteolata (crataegata), Rumia	84, 157	menyanthidis, Pharetra 18, 46,	
lutosa, Calamia	91, 241	238, 324, 327	
lutulenta, Epunda	62, 264, 334	mercurella, Scoparia	19, 139
Lycanida	80	var. portlandica	19
Lycenidae 1, 52, 80, 202, 221,		mercuriana (monticolana), Pimplusia 18	
242, 303, 311		meridiana, Conchylis	230
Lycenidi	5, 26	mesomella, Lithosia 92, 211, 298, 334	
lycaon, Epinephele	53, 82, 83	messoria, Agrotis	99
lychnitis, Cucullia	98	meticulosa, Brotholomia 93, 138,	
		157, 266	
machaon, Papilio 5, 26, 48, 52,		metzneri, Platyptilia	14, 232
81, 83, 178, 214, 223, 225,		mi, Euclidia	17, 238
253, 254, 274, 275, 303		Miana	328
macilenta, Orthosia	19, 334	miata, Cidaria	43
Macro-Heterocera	304	micacea, Hydroecia 93, 157, 298	
MacroGLOSSINAE	47	microdactylus, Leioptilus	231
Macro-Lepidoptera	194	Micro-Lepidoptera	194, 198, 205
		Micropterygidae	195

	PAGE
olivata, Larentia	16, 18, 54, 91, 327
ononaria, Aplasta	...
oo, Dicycla	40, 89, 90, 275, 276, 334
<i>ab. renago</i>	... 40, 334
ophiogramma, Apamea	9, 68, 100, 130
opima, Taenioecampa	...
Oporabia	247, 282, 285, 315
Oporinia	...
oppressana, Coccyx	...
optilete, Polyommatus	...
or, Cymatophora	...
orbicularia, Zonosoma	...
orbitulus, Polyommatus	...
orbona (comes), Triphaena	19, 70,
	118, 182, 266
<i>ab. adsequa</i>	...
<i>ab. connuba</i>	...
<i>ab. grisea</i>	...
<i>ab. ochrea</i>	...
<i>ab. rufo-ochrea</i>	...
<i>ab. subsequa</i>	...
orion, Moma	...
orithya, Junonia	...
ornata, Acidalia	...
ornatella, Phycis (Pempelia)	...
ornatipennella, Coleophora	...
Orneodes	...
ornithopus, Xylina	...
Orrhodia	...
ostrina, Thalpochares	...
oxyacanthae, Miselia	18, 19, 298,
	332, 334
<i>ab. capucina</i>	...
oxyacanthella, Xylopoda	...
Oxyptilus	...
pacta, Catocala	...
padella, Yponomeuta	...
palaemon (paniscus), Carterocephalus	...
palaeno, Colias	...
PALÆO-LEPIDOPTERA	...
paleacea, Cosmia	...
palealis, Spilodes	...
pales, Brenthis	...
<i>ab. napaea</i>	...
pallens, Leucania	22, 137, 157, 333
pallidactyla (bertrami), Platyptilia	17
palpina, Ptilodontis	...
paludata (imbutata), Carsia	...
paludis, Hydroecia	...
palustrella, Gelechia	...
palustris, Hydrilla	...
Pamphilidi	...
pamphilus, Coenonympha	82, 83,
	207, 226, 253, 281, 304, 314, 331
<i>ab. albescens</i>	...
<i>ab. lyllus</i>	...
<i>ab. ocellata</i>	...
<i>ab. pallida</i>	...
paphia, Dryas	26, 53, 81, 83, 92, 274
<i>var. valezina</i>	...
Papilio	...
papilionaria, Geometra	22, 91, 326, 333
Papilionida	...

	PAGE.
Papilionidae	4, 5, 52, 81, 203,
	223, 242, 303.
Papilionides	52, 80, 83, 196, 202,
	221, 303, 311
parallelaria (vespertina), Epione	...
	214, 269, 274, 275.
Pararge	...
paripennella, Coleophora	...
Parnassidae	...
Parnassi-Papilionidae	...
parta, Catocala (by error) <i>vide</i> pacta, C.	...
parthenias, Brephos	...
parthenie, Melitaea	...
parva, Thalpochares	...
parvidactylus, Oxyptilus	...
<i>ab. ochreous</i>	...
pascuellus, Crambus	...
pasiphae, Epinephele	...
paula, Thalpochares	...
pavonia, Saturnia	46, 93, 145,
	146, 148, 211, 213, 214, 260
pedaria, Phigalia	94, 95, 117, 118,
	268, 289, 327
pelidnodactylus (mictodactylus),	
Mimaeseoptilus	...
peliella, Gelechia	...
peltigera, Heliothis	...
pendularia, Zonosoma	...
pennaria, Himeria	...
pentadactyla, Acipitilia	...
penziana, Sciaphila	...
perla, Bryophila	...
<i>ab. suffusa</i>	...
perlellus, Crambus	...
<i>ab. warringtonellus</i>	...
perochraria, Acidalia	42, 336, 337
Pericopidae	...
permutana, Peronea	...
persicariae, Mamestra	...
petasitis, Hydroecia	...
petrosa, Nemeophila	187, 188, 190, 192
pflugiana, Ehiphiphophora	...
phicomone, Colias	27, 28, 80, 81,
	290, 297
Phigalia	...
philanthiformis, Sesia	...
phlaeas, Chrysophanus	5, 18, 92,
	157, 222, 253, 254, 270, 303, 311, 331
<i>ab. fasciatus</i>	...
<i>ab. intermedia</i>	...
<i>var. chinensis</i>	...
<i>var. eleus</i>	...
Phobetrion	...
phoebe, Melitaea	...
Phothedes	...
phragmitidis, Calamia	...
phrygialis, Heryna	...
Phycitidae	...
Phycitides	...
pictaria, Aleucis	...
Pieridae	52, 81, 199, 203, 223,
	242, 303, 312
Pieridi	...
Pieris	...
pilosellae, Oxyptilus	...

	PAGE		PAGE
pilosellae, Zygaena ...	99	populetorum, Gracilaria ...	181
pimpinellata, Eupithecia ..	209	populi, Poecilocampa ...	48, 66, 295
pinetellus, Crambus ...	22	populi, Smerinthus 23, 109, 157,	
pinguinis, Aglossa ...	180	233, 234, 298, 299, 300, 301 302	
pinaria, Bupalus ...	213, 240	populi-ocellatus, Smerinthus ...	299
piniperda, Panolis 18, 155, 157,		porata, Zonosoma ...	22, 138
182, 183, 333		porcellus, Choerocampa 65, 209, 288	
pisi, Hadena ...	238, 266	porrinata, Nemoria ...	173
pistacina, Anchocelis ...	185, 332	postrema, Penthina ...	241
ab. serina ...	332	potatoria, Odonestis 46, 287, 288	
pityocampa, Cnethocampa ...	127	poterii, Nepticula ...	120
plagiata, Anaitis 22, 139, 173, 214		praelatella, Lampronia ...	67
plagiodactyla, Stenoptillia ...	231	prasina, Aplecta 19, 48, 58, 91, 266	
plantaginis, Nemeophila 16, 18,		prasinana, Hylophila ...	48
65, 66, 91, 93, 99, 187, 188,		pratellus, Crambus ...	93
190, 191, 192, 214, 230, 239,		precursaria, Oporabia ...	248, 317
260, 261, 307, 330		proboscidalis, Hypena ...	138
ab. alba ...	191	profugella, Asychna ...	209
ab. alba-matronalis 190, 192		promethea, Callosamia ...	161
ab. alba-obsoleta ...	190	promissa, Catocala ...	69, 274
ab. flava-matronalis ...	191	promutata, Acidalia, vide margine-	
ab. flava-obsoleta ...	191	punctata, A.	
ab. hospita 16, 65, 187, 190,		pronoë, Erebia ...	53
191, 261, 330		pronuba, Triphaena 46, 65, 70, 93,	
ab. lutea ...	191	157, 266, 298	
ab. lutea-obsoleta ...	191	ab. ochrea ...	70
ab. obsoleta ...	191	ab. ochrea-brunnea ...	70
ab. matronalis 16, 188, 189,		propinquella, Depressaria ...	43
190, 191, 230		prosapiaria, Elloppia 92, 138, 157,	
ab. rufa ...	191, 330	239, 298	
ab. rufa-matronalis ...	191	proserpina, Satyrus ...	26
ab. rufa-obsoleta ...	191	protea, Hadena ...	298, 334
var. caucasia ...	191	protodice, Pieris ...	331
platyptera, Calophasia ...	2	PROTO-LEPIDOPTERA ...	194, 196
Platypterygides ...	196	prunaria, Angerona 48, 214, 240	
plecta, Noctua 93, 142, 266, 333		var. sordidata ...	48
plumbana, Dierorhampha ...	67	prunata, Cidaria ...	93, 298
plumbagana, Dierorhampha ...	67	pruni, Ino ...	271
plumbaria, Eubolia ...	139, 239	pruni, Thecla 1, 73, 74, 75, 214,	
plumbeolata, Eupithecia ...	239, 334	274, 275	
plumistraria, Eurranthis 177, 178,		pryerella, Ephestia ...	41
213, 236		pseudopretella, Oecophora 289, 324	
Plusia ...	290, 298	psi, Triana ...	91, 238, 239
Plutellidae ...	198	Psychidae ...	137, 198
podalirius, Papilio 26, 52, 80, 81,		Psychides ...	196
83, 223, 225, 253, 254, 303		pterodactylus, Minnaeseptilus ...	17
var. feisthamelii ...	254	Pterophoridae ...	198
var. latteri ...	254	Pterophorides ...	14, 54, 175, 231
polata, Cidaria (Larentia) 247, 283		Pterophorina ...	231
polychloros, Eugonia 28, 92, 225,		Pterophorus ...	3, 231
250, 252, 275, 304, 313, 328		pubibunda, Dasychira ...	48, 295
polygrammata, Phibalpteryx ...	336	pudorina, Acræa ...	71
Polyommatus ...	79	pudorina, Leucania ...	92
polyxena, Thais ...	185, 253	pulchella, Deiopeia ...	41, 157, 336
var. cassandra 253, 254, 255		pulchellata, Eupithecia ...	121, 298
pomifoliella, Lithocolletis ...	62	pulcherimella, Depressaria ...	44
pomonana, Carpopapsa ...	175	pulchrina, Plusia 93, 98, 152, 266	
pomonaria, Nyssia ...	40	pulveraria, Numeria ...	176, 239
popularis, Neuronis 66, 146, 179		pulverulenta, Taeniocampa 46, 97,	
populata, Cidaria ...	118, 200, 201	129, 155, 165, 333	
ab. dotata ...	200, 201	pumilata, Eupithecia 93, 138, 155	
populeti, Taeniocampa 95, 121,		punctaria, Zonosoma ...	22
155, 156, 182, 183, 268, 295		punctulata, Tephrosia ...	155
ab. intermedia ...	156	punicealis, Pyrausta ...	175
ab. obsoleta ...	156	purpuralis, Pyrausta ...	102, 175

	PAGE		PAGE
purpurella, <i>Depressaria</i> ...	43	ridens, <i>Asphalia</i> ...	20, 62, 210, 211
purpurella, <i>Micropteryx</i> ...	184	Riodinidae ...	242
pusaria, <i>Cabera</i> ...	333	rivata, <i>Melanippe</i> ...	174
pusiella, <i>Psecadia</i> ...	175, 230, 231	rivulana, <i>Sericoris</i> ...	14, 230
pustulata (<i>baularia</i>), <i>Phorodesma</i>	296, 297, 326	roboraria, <i>Boarmia</i> ...	20, 62, 296
puta, <i>Agrotis</i> ...	22	rorellus, <i>Crambus</i> ...	41
putris, <i>Axylia</i> ...	266	rosana, <i>Tortrix</i> ...	94, 230
pygmaeana, <i>Steganoptycha</i> 2,	68,	rubi, <i>Callophrys</i> 94, 182, 221, 253,	254, 282, 303, 812.
	129, 184	rubi, <i>Lasiocampa</i> (<i>Bombyx</i>)	18,
pygmaeata, <i>Eupithecia</i> ...	239		62, 68, 69, 91, 149, 211
pyraliata, <i>Cidaria</i> ...	201, 298	rubi, <i>Noctua</i> ...	22, 93, 268
Pyralidae ...	72, 175, 198	ruberata, <i>Hypsipetes</i> ...	70, 201
Pyralides 15, 41, 54, 84, 93, 125,	196, 230	rubidata, <i>Anticlea</i> ...	111
	40	rubicella, <i>Lampronia</i> ...	67
pyralina, <i>Calymnia</i> ...	175, 230	rubiginata (<i>rubricata</i>), <i>Acidalia</i>	174, 229, 267, 296
Pyraloides ...	144, 145, 146	rubiginea, <i>Dasycampa</i> 2, 40, 93,	147, 154, 155, 178, 183, 264
pyri, <i>Saturnia</i> 54, 112, 113, 141,	20, 236	rubricollis, <i>Gnophria</i> 43, 62, 148,	211, 264, 275
	198	rubricosa, <i>Pachnobia</i> 182, 209, 333	
pyrina (<i>aesculi</i>), <i>Zeuzera</i> ...	14, 15	rubrireana, <i>Hadena</i> ...	142
Pyromorphidae ...	67	rubrotibiella (<i>tumidana</i>), <i>Rhodo-</i>	
pyropella, <i>Pleurota</i> ...	275, 276	phaea ...	126, 329, 330
pyrrhulipennella, <i>Coleophora</i> ...	99	rufaria, <i>Acidalia</i> ...	174
	93, 157, 266	rufillana, <i>Semasia</i> ...	209, 241
quadra, <i>Oenistis</i> ...	20	rufina, <i>Anochelis</i> <i>vide</i> <i>helvola</i> , <i>A.</i>	
quadridentata, <i>Agrotis</i> ...	84, 141, 186	rumicis, <i>Phaetra</i> 22, 238, 266, 333	
quadripunctata, <i>Caradrina</i> 93, 157, 266	97, 98	rumicivorella, <i>Gelechia</i> ...	231
quercana, <i>Hylophila</i> ...	2	rupicapraria, <i>Hybernina</i> ...	94
quercifolia, <i>Gastropacha</i> 84, 141, 186	62, 68, 69, 210, 287, 288	rurea, <i>Xylophasia</i> 17, 46, 65, 91,	93, 248.
quercinaria, <i>Ennomos</i> ...	2, 18, 62, 89, 93		
quercus, <i>Lasiocampa</i> (<i>Bombyx</i>) 2,	92, 117, 210, 211	<i>ab. alopecurus</i> ...	93
		<i>ab. combusta</i> ...	65, 91, 238
<i>var. callunae</i> 2, 18, 62, 89, 93		ruricolecta, <i>Tinea</i> ...	120, 330
quercus, <i>Zephyrus</i> 92, 117, 210, 211		russula, <i>Euthemonia</i> 84, 141, 190, 239	
		rusticata, <i>Acidalia</i> ...	94, 229
radiatella, <i>Cerostoma</i> ...	120		
radiellus, <i>Crambus</i> ...	15	sagittata, <i>Cidaria</i> ...	275
ramburialis, <i>Diasemia</i> ...	336	salicata, <i>Larentia</i> ...	91, 174, 327
raschkiella, <i>Laverna</i> ...	96	salicis, <i>Leucoma</i> ...	157, 230
rapae, <i>Pieris</i> 48, 81, 83, 94, 135,	303, 312, 331	salicorniae, <i>Lita</i> ...	19, 129, 184
	81	salopiella, <i>Micropteryx</i> ...	151, 152
<i>var. manii</i> ...	18, 91	samadensis, <i>Gelechia</i> ...	15
rectilinea, <i>Hyppa</i> (<i>Hadena</i>)	210, 333	sambucata, <i>Uropteryx</i> ...	91, 298
remutaria, <i>Acidalia</i> ...	42, 175	sangii, <i>Micropteryx</i> ...	184
repandalis, <i>Botys</i> ...	157, 174	sanguinalis, <i>Rhodaria</i> ...	175
repandata, <i>Boarmia</i> ...	46	sao, <i>Syrichthus</i> 26, 221, 250, 303	
<i>var. destrigaria</i> ...	90, 183, 184	sarpedon, <i>Zygaena</i> ...	272
reticella, <i>Epichnopteryx</i> 90, 183, 184	125, 214, 275, 336	satellitina, <i>Scopelosoma</i> 93, 129, 155	
reticulata, <i>Cidaria</i> 125, 214, 275, 336	225, 253, 269, 270, 279, 280,	saturnana, <i>Dicrorhampha</i> ...	43
retusa, <i>Plastenis</i> ...	312, 329	Saturnia ...	148, 197
rhamni, <i>Gonepteryx</i> 52, 81, 83,	280	Saturniidae ...	286, 287
	53, 81	Saturniades ...	286, 287
<i>ab. farinosa</i> ...	280	Saturnidae ...	197, 199
<i>ab. intermedia</i> ...	53, 81	Saturniides ...	54, 93, 141, 196
riphaeus, <i>Urania</i> , <i>vide</i> <i>madagas-</i>		satyrata, <i>Eupithecia</i> 17, 93, 239	
<i>cerensis</i> , <i>Chrysidia</i>		Satyridae ...	5, 53, 203, 313
Rhodoceri ...	5	satyrion, <i>Coenonympha</i> ...	27, 203
rhododactylus, <i>Cnaemidophorus</i> 40,	214, 231, 275	saucia, <i>Peridroma</i> ...	22, 331
	214, 231, 275	<i>ab. margaritosa</i> ...	129
Rhopalocera 157, 202, 221, 249,	272, 279	<i>var. nigrocosta</i> ...	129
	55	sauciana, <i>Penthina</i> ...	327
ribeana, <i>Tortrix</i> ...	55	scabrella, <i>Harpiteryx</i> ...	120

	PAGE		PAGE
scabriuscula, Dipterygia ...	334	Sphingidae ...	4, 228
scardactylus, Leiopitilus ...	231	Sphingides 1,3, 84, 141, 167, 196, 228	
schiffermilleriella, Nematois ...	96	Sphinx ...	146
scipio, Erebia ...	203	sphinx, Asteroscopus ...	63
scoliaeforme, Sesia ...	214, 275	splendidella (abietella), Dioryctria ...	176
scolopacina, Xylophasia ...	66, 334	sponsa, Catocala ...	69, 274, 327
scriptella, Gelechia ...	181, 209, 241	sponsana, Peronea ...	94
scutosa, Heliothis ...	336	spurcella, Gelechia ...	15, 231
sebrus, Nomiades ...	222	stabilis, Taeniocampa ...	46, 97, 129, 155, 182, 209, 333
segetum, Agrotis ...	22, 46, 238, 333	ab. obliqua ...	182
Selenia ...	213, 289	ab. pallida ...	182
selene, Brenthis ...	22, 214	ab. rufa ...	182
semele, Hipparchia ...	26, 83, 92, 203, 207, 297, 314	ab. suffusa ...	182
ab. caeca ...	314	stachydalis, Ebulea ...	208
ab. suffusa ...	314	stagnalis, Hydrocampa ...	175
semiargus, Nomiades ...	26, 250	statices, Procris ...	13, 88, 105, 239
semicana, Macytha ...	198	var. heydenreichii ...	13
semicostella (parenthesella), So-		stellatarum, Macroglossa ...	84, 94, 96, 141
phronia ...	14	stibiana, Sericoris ...	230
semifulvella, Tinea ...	139	sticticalis, Spilodes ...	267
semipurpurella, Micropteryx ...	184, 195	stigmatella, Gracilaria ...	43, 209
senescens, Butalis ...	120	stigmatica (rhomboidea), Noctua ...	20, 40, 66, 244, 334
sericealis, Rivula ...	93	stigmatodactylus, Mimaeseoptilus ...	14
serena, Hecatera ...	157	stipella, Oecophora ...	16
Sesiidae ...	32, 137, 198	stoechadis, Zygaena ...	168, 169
Sesiides ...	196	straminata, Acidalia ...	92, 210, 240
sexalisata, Lobophora ...	239	straminea, Leucania ...	90, 120, 152, 186
sibylla, Limenitis ...	1, 39, 92, 214, 263, 274, 275	strataria, Amphidasys ...	99, 109, 128, 129, 211, 289
sidae, Syrichtus ...	303	striatella, Paltodora ...	140
silaceata, Cidaria ...	239, 333	strigataria, Phigalia ...	239
similis, Porthesia ...	213, 239	strigilis, Miana ...	91, 266, 333
simpliciana, Dicerorhampha ...	42	strigillaria, Aspilates ...	16, 182, 211, 240
simulans (pyrophila), Agrotis ...	19	strigula (porphyrea), Lycophotia ...	18, 91, 92, 182, 238
sinapis, Leucophasia ...	1, 5, 26, 42, 53, 81, 83, 185, 203, 206, 214, 224, 253, 255, 256, 274, 275, 279	strigula, Nola ...	214, 275
ab. diniensis ...	53, 81	strobilella, Coceyx ...	67, 264
ab. erysimi ...	53, 81	stygne, Erebia ...	337
ab. lathyri ...	224	suavella, Rhodophaea ...	64, 121
sinuana, Sciaphila ...	96	subdolellus, Megacraspedus ...	140
sinuella, Homaeosoma ...	175	subfulvata, Eupithecia ...	91, 334
siterata, Cidaria ...	19, 91, 157	subgothica, Agrotis ...	99
smaragdaria, Phorodesma ...	90, 229, 240, 274	sublustris, Xylophasia ...	214, 266, 268, 297
Smerinthus ...	114, 146, 299	subnotata, Eupithecia ...	91, 334
sobrina, Noctua ...	19	subpropinquella, Depressaria ...	43
sobrinata, Eupithecia ...	121, 174	subpurpurella, Micropteryx ...	184
socia, Xylina ...	20, 63	subrosea, Agrotis ...	42, 120, 124, 336
sociata, Melanippe ...	111, 139, 167, 174	subsequa, Triphaena ...	2, 62, 93
sociella, Aphomia ...	46, 93, 259, 288	subsericeata, Acidalia ...	334
solaris, Acontia ...	42	subtellella, Tinea ...	19
solidagnis, Lithomia ...	66, 91, 125, 326	subtusa, Platenis ...	66, 96, 121, 268, 332
sophialis, Evergestis (Orobena) ...	230	subumbrata, Eupithecia ...	152
sorbi, Lithocolletis ...	62	succenturiata, Eupithecia ...	240
sorbiella, Argyresthia ...	231	sudetica, Scoparia ...	15, 230
sordidata (elutata), Hypsipetes, vide		suffumata, Cidaria ...	17, 182, 240, 333
fureata, Hydrimena ...		suffusa, Peridroma (Agrotis) ...	22, 93, 157, 266
sororcula, Lithosia ...	296	suppeliella, Gelechia ...	2, 155
sparganii, Nonagra ...	336	suspecta, Depressaria ...	91, 93, 327
sparmarella, Micropteryx ...	184	syllius, Melanargia ...	304
sparsata, Collix ...	92	sylvanus, Pamphila ...	83, 92, 297, 311
spartii, Lasiocampa (Bombyx) ...	68, 69, 288	sylvata (ulmata), Abraxas ...	46, 268, 304, 305, 332, 334
sphegiformis, Sesia ...	334		

	PAGE		PAGE
<i>ab. intermedia</i> ...	307	<i>trifolii</i> , <i>Hadena</i> ...	22, 142, 157, 166
<i>ab. obscura</i> ...	307	<i>trifolii</i> , <i>Lasiocampa</i> (<i>Bombyx</i>) ...	68, 69
<i>ab. suffusa</i> ...	307	<i>trifolii</i> , <i>Zygaena</i> ...	69, 87, 88, 99,
<i>ab. transversa</i> ...	307	103, 104, 105, 106, 167, 168,	
<i>sylvinus</i> , <i>Hepialus</i> ...	55, 157, 297, 333	169, 171, 261, 271, 272, 273, 295	
<i>Syntomidae</i> ...	196	<i>ab. confuens</i> ...	261
<i>syringaria</i> , <i>Pericallia</i> ...	22, 92, 336	<i>var. dubia</i> ...	69, 169
<i>Tachyptilia</i> ...	231	<i>trifolii-filipendulae</i> , <i>Zygaena</i> ...	270
<i>Taeniocampa</i> ...	157	<i>trifolii-major</i> , <i>Zygaena</i> ...	88, 167,
<i>tages</i> , <i>Thanaos</i> ...	221, 253, 311	234, 261	
<i>tagis</i> , <i>Anthocharis</i> ...	223, 304	<i>trigeminana</i> , <i>Ephippiphora</i> ...	43
<i>var. bellezina</i> ...	174	<i>trigeminata</i> , <i>Acidalia</i> ...	186, 210
<i>tamarisciata</i> , <i>Eupithecia</i> ...	174	<i>trigrammica</i> , <i>Grammesia</i> ...	266, 333, 334
<i>taraxaci</i> , <i>Caradrina</i> ...	19, 93, 142, 326	<i>ab. bilinea</i> ...	238
<i>tau</i> , <i>Aglia</i> ...	148	<i>ab. obscura</i> ...	261
<i>telicanus</i> , <i>Lampides</i> ...	303	<i>trimacula</i> (<i>chaonia</i>), <i>Notodonta</i> ...	295
<i>templi</i> , <i>Dasypolia</i> ...	179, 181, 295, 335	<i>tripartita</i> , <i>Habrostola</i> ...	93, 138
<i>tenebrosa</i> , <i>Rusina</i> ...	91	<i>tripoliana</i> , <i>Catoptria</i> ...	337
<i>tenuicornis</i> , <i>Ino</i> ...	271	<i>tripunctella</i> , <i>Acompsia</i> (<i>Gelechia</i>) ...	54, 231
<i>tephradactylus</i> , <i>Leioptilus</i> ...	120	<i>triquetrella</i> , <i>Solenobia</i> ...	2
<i>Tephrosia</i> ...	3, 8, 28, 29, 47, 64,	<i>tristata</i> , <i>Melanippe</i> ...	17
108, 172, 213, 259, 289, 319,		<i>tristellus</i> , <i>Crambus</i> ...	175, 230, 237
323, 324		<i>tristis</i> , <i>Oxyptilus</i> ...	231
<i>terebrella</i> , <i>Ceratemna</i> ...	129	<i>tritici</i> , <i>Agrotis</i> ...	31
<i>terrealis</i> , <i>Botys</i> ...	175	<i>trivia</i> , <i>Melitaea</i> ...	203
<i>tersata</i> , <i>Phibalapteryx</i> ...	54	<i>truncata</i> (<i>russata</i>), <i>Cidaria</i> ...	22, 31,
<i>tesseradactyla</i> (<i>fischeri</i>), <i>Platyptilia</i> ...	45, 71	<i>ab. perfuscata</i> ...	139, 332
<i>testacea</i> , <i>Luperina</i> ...	157, 298	<i>truncicolella</i> , <i>Scoparia</i> ...	327
<i>testata</i> , <i>Cidaria</i> ...	93, 298	<i>tumidella</i> (<i>zelleri</i>), <i>Rhodophaea</i> ...	329, 330
<i>tetradactyla</i> , <i>Acipitilia</i> ...	14, 46, 54, 231	<i>turca</i> , <i>Leucania</i> ...	92
<i>tetragonella</i> , <i>Aristotelia</i> (<i>Gelechia</i>) ...	44	<i>turfosalis</i> , <i>Tholomiges</i> ...	93
<i>tetralunaria</i> , <i>Selenia</i> ...	22, 140, 205	<i>turionana</i> , <i>Retinia</i> ...	67
<i>thalassina</i> , <i>Hadena</i> ...	238, 266, 333	<i>tutti</i> , <i>Megacraspedus</i> ...	140, 231
<i>thauamas</i> , <i>Thymelicus</i> ...	92, 311	<i>tyndarus</i> , <i>Erebina</i> ...	26, 203, 262
<i>Theclidi</i> ...	5	<i>typhon</i> , <i>Coenonympha</i> ...	99, 238, 331
<i>therinella</i> , <i>Coleophora</i> ...	208	<i>var. inornata</i> ...	99
<i>Thyrididae</i> ...	137	<i>var. laidion</i> ...	99, 331
<i>tiliae</i> , <i>Smerinthus</i> ...	85, 145, 150,	<i>var. orcadeae</i> ...	331
151, 154, 214, 233, 234, 299,		<i>ulicetana</i> , <i>Catoptria</i> ...	94
300, 301, 302		<i>ulmella</i> (<i>conspicualis</i>), <i>Scoparia</i> ...	327
<i>timandra</i> , <i>Elymnias</i> ...	276	<i>ab. banded</i> ...	41
<i>tincta</i> , <i>Aplecta</i> ...	91, 334	<i>umbra</i> , <i>Chariclea</i> ...	63
<i>Tineides</i> ...	14, 94, 196, 232	<i>umbratica</i> , <i>Cucullia</i> ...	93, 155, 295
<i>Tineina</i> ...	126, 140	<i>unanimis</i> , <i>Apamea</i> ...	91, 268
<i>tiphon</i> , <i>Coenonympha</i> , <i>vide typhon</i> , C.		<i>unca</i> , <i>Hydrelia</i> ...	17, 93, 126, 211
<i>tithonus</i> , <i>Epinephele</i> ...	36, 83, 92,	<i>undulana</i> (<i>revayana</i>), <i>Sarrothripa</i> ...	142, 181
270, 314		<i>unidentaria</i> , <i>Coremia</i> ...	139, 182, 213,
<i>togata</i> , <i>Eupithecia</i> ...	208, 211	298, 333	
<i>Tortricides</i> ...	14, 55, 84, 94, 126,	<i>unifasciata</i> , <i>Cymatophora</i> ...	91
175, 196, 230		<i>unimaculella</i> , <i>Micropteryx</i> ...	151, 162, 184
<i>trabealis</i> , <i>Agrophila</i> ...	84, 142, 267	<i>unipuncta</i> (<i>extranea</i>), <i>Leucania</i> ...	42, 95
<i>transalpina</i> , <i>Zygaena</i> ...	14, 84, 87,	<i>unita</i> , <i>Lithosia</i> ...	
103, 168, 169, 175		<i>ab. flaveola</i> ...	141
<i>trapezina</i> , <i>Cosmia</i> ...	157	<i>Uranidae</i> ...	158
<i>treitschkiella</i> , <i>Antispila</i> ...	241	<i>Urota</i> ...	197
<i>trepida</i> , <i>Notodonta</i> ...	294	<i>ursaria</i> , <i>Biston</i> ...	289, 290
<i>trepidaria</i> , <i>Psodos</i> ...	16	<i>urticae</i> , <i>Aglais</i> ...	18, 25, 28, 48, 128,
<i>triangulum</i> , <i>Noctua</i> ...	182, 266	133, 157, 213, 226, 239, 250,	
<i>trifasciata</i> (<i>autumnalis</i> = <i>impluviata</i>), <i>Hypsipetes</i> ...	70, 86, 111, 139,	313, 332, 336	
201, 211		<i>var. polaris</i> ...	213, 313
<i>ab. literata</i> ...	201		

	PAGE
urticae, Spilosoma ...	41, 157
vaccinii, Orrhodia ...	18, 19, 155
vagans, Aphytoceros ...	151
Vanessidi ...	5, 25
variata, Thera ...	139, 157, 330
variegana, Peronea ...	94, 209, 210, 269
velleda, Hepialus ...	297, 327
var. gallicus ...	297
venerabilis, Agrotis ...	99
venosa, Pharetra (Arsilonche) ...	296
venosata, Eupithecia ...	152, 295
verbasci, Cucullia ...	65, 154, 239
verberata, Larentia ...	229
verellus, Crambus ...	41, 336
verhuelletta, Teichobia ...	43
vernaria, Iodis ...	173
versicolor, Endromis ...	40, 65, 98, 124, 146, 154
verticalis (cinctalis), Spilodes ...	84, 175
vetusta, Calocampa ...	18, 93, 183
vibicella, Coleophora ...	232
viburniana, Tortrix ...	14, 18
vicinella, Lita ...	36
vidua (melanopa), Anarta ...	125
viduaria, Cleora ...	42, 336
villica, Arctia ...	192, 214, 307
viminalis, Oleoceris ...	91
vinculella, Tinea ...	4, 19
vinula, Cerura ...	154, 157, 298, 333
viretata, Lobophora ...	22, 42, 139
viridaria, Larentia ...	23, 138
viridaria (aenea), Phytometra ...	17, 291, 292
viridata, Nemoria ...	84
virgata, Mesotype ...	139
virgaurea, Chrysophanus ...	80, 83, 202
virgaureaella, Coleophora ...	264
virgaureata, Eupithecia ...	331, 334
viscariella, Lita ...	36
vitalbata, Phibalapteryx ...	22
vitellina, Leucania ...	2, 42, 336
vittata (lignata), Phibalapteryx ...	91, 268, 333
vorticella, Anacamptis ...	121
vulgata, Eupithecia ...	239
vulnerans, Doratifer ...	198
wahlbomiana, Cnephasia ...	230
w-album, Thecla ...	1, 66, 270, 274, 275, 292
wilkinsonella, Coleophora ...	209
xanthodactyla, Acipitilia ...	231
xanthographa, Noctua ...	70, 157, 182, 297, 298, 332
ab. cohaesa ...	70, 332
ab. obscura ...	70
ab. rufescens ...	70
xanthomista, Polia ...	39, 40, 59, 89, 209, 213
var. nigrocincta ...	23, 60, 66, 91
xerampelina, Cirrhoedia ...	219
yama-mai, Antheraea ...	84
Ypsipetes ...	84
zelleri, Scoparia ...	93

	PAGE
zephyrana, Argyrolepia ...	43
zephyrus, Polyommatus ...	294
var. lycidas ...	294
Zeuzerides ...	194, 196
ziczac, Notodonta ...	298
zinckenii, Xylina ...	336
zonaria, Nyssia ...	48, 68, 70, 125
zophodactylus (loewii), Mimnaeseop-tilus ...	175
Zygaena ...	47, 87, 104, 105, 106, 168, 170, 176, 271, 272
Zygaenae ...	272, 273
Zygaenidae ...	69, 87, 137, 168, 198, 271
Zygaenides ...	13, 55, 69, 84, 103, 175, 196, 229, 271

ODONATA.

Agrionidae ...	47
elegans, Ischnura ...	239
fusca, Sympyca ...	239
puella, Agrion ...	239
pulchellum, Agrion ...	239

ORTHOPTERA.

Acridiidae ...	227
Acridioidea ...	226
aegyptium, Acridium ...	227
annulipes, Anisolabis ...	155
batracho, Tettix ...	24
bipunctatus, Tettix ...	228
cinerascens, Pachytylus ...	227
cinereus, Thamnotrizon ...	41
insubricus, Acrotylus ...	227
Locustidae ...	41
longipes, Acrotylus ...	227
migratorius, Pachytylus ...	227
Oedipodidae ...	227
patruelis, Acrotylus ...	227
peregrina, Schistocerca ...	71, 227, 228
Phymateus ...	24
strepens, Epacromia ...	226, 227
subulatus, Tettix ...	228
tanulus (tricoloripes), Epacromia ...	227
tergestina, Epacromia ...	226, 227
Tettigidae ...	228
Tettix ...	228
thalassina, Epacromia ...	226, 227
Tryxalidae ...	226

PSEUDO-NEUROPTERA.

malayanus, Termes ...	100
-----------------------	-----

TRICHOPTERA.

guttatipennis, Halesus ...	67
----------------------------	----

